News of the Industry Begins Page 455

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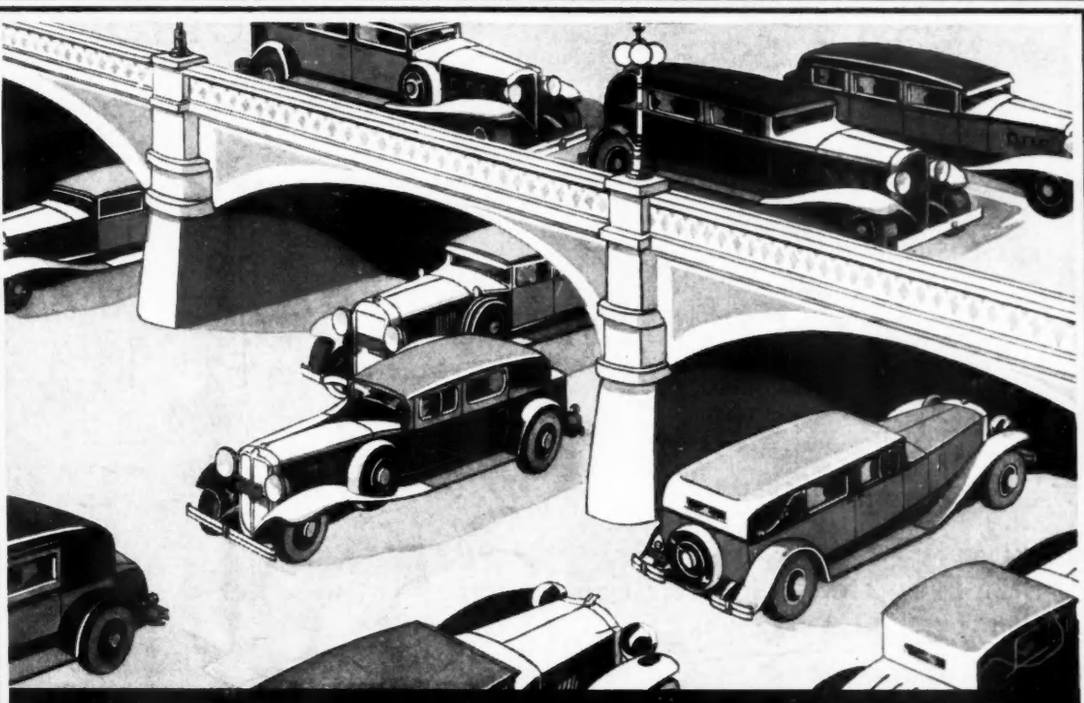

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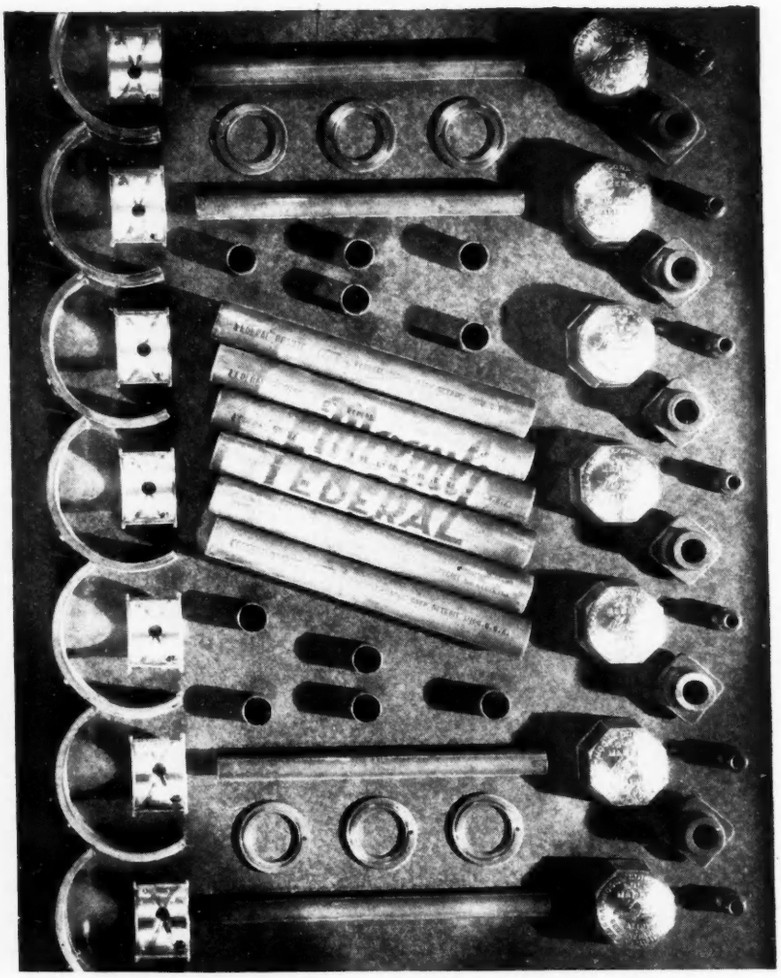

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Vol. 64 No. 11

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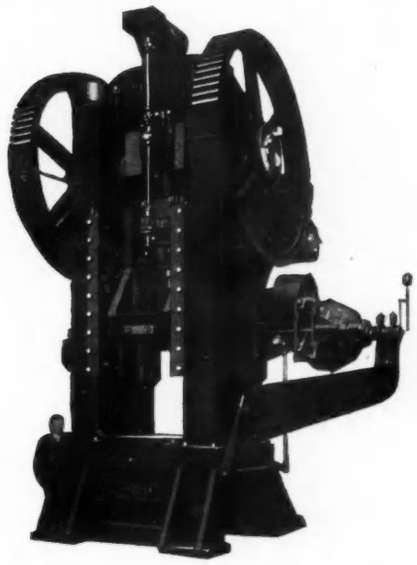

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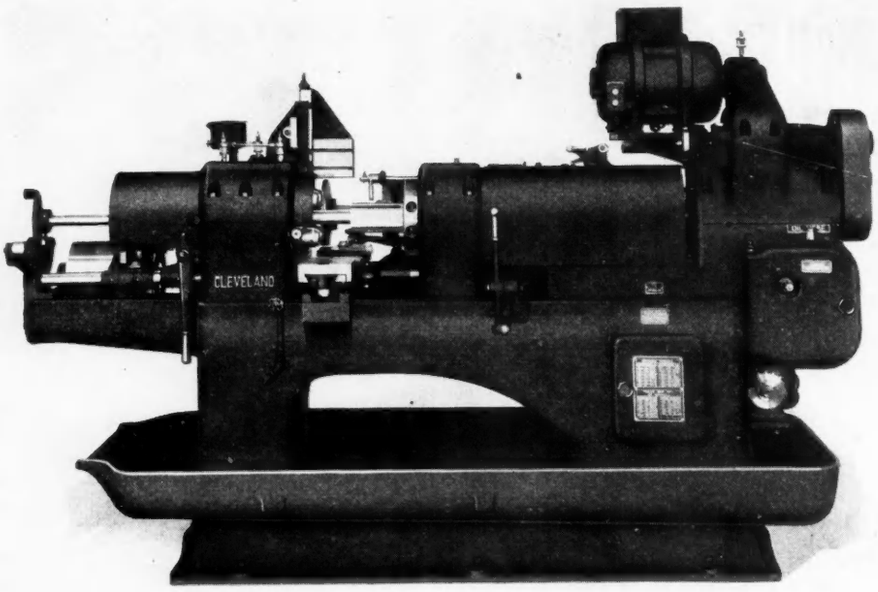

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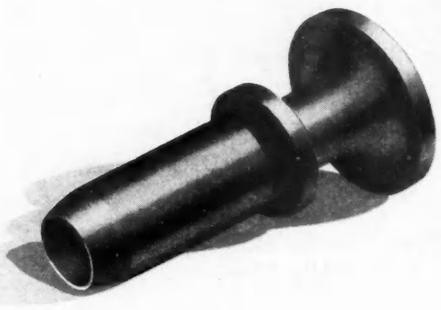

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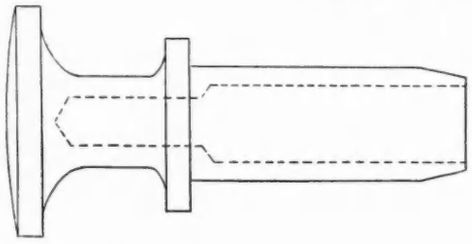

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AUTOMOTIVE INDUSTRIES

VOLUME 64 MARCH 14, 1931 NUMBER 11

Prices Drop, Stocks Gain In Dormant Rubber Market

by

Harry Symington

Symington & Sinclair

THE year 1930 has again been a difficult one for all connected with the rubber trade and particularly so for rubber producers who have been faced with a steady accumulation of surplus stock and a falling price. Shipments for the year exceeded consumption by 138,500 tons, or an average rate of about 11,500 tons per month. Consumption showed a decline of 17 per cent as compared with shipments.*

The year at any rate is not starting well. U. S. A. consumption for January is only 28,557 tons compared with 36,669 tons for January 1930. The generally accepted estimate for the first quarter is that consumption will be somewhere between 90,000 and 95,000 tons against 105,000 tons last year. Consumption for the second quarter of last year totaled 115,000 tons, so that if the first quarter of 1931 is 10,000 tons behind last year the second quarter will have to reach a total of 125,000 tons to make up the leeway, leaving aside altogether the question of any increase.

Outside of the U. S. there seems little reason to anticipate any increase in consumption. Russia and Japan may possibly use a little more. On the other hand, some of the European countries may very well use considerably less, unless general trade conditions improve materially.

Failing a general improvement in world trade conditions, we will be surprised if world consumption this year exceeds 690,000 tons, and it is possible that the 1930 total of 676,500 tons may not even be reached, so that unless something happens to reduce production well below our estimates, we will reach the end of 1931, not with that substantial reduction in world stock which appears so essential, but with an addition to the surplus of a further 40,000 or even 50,000 tons.

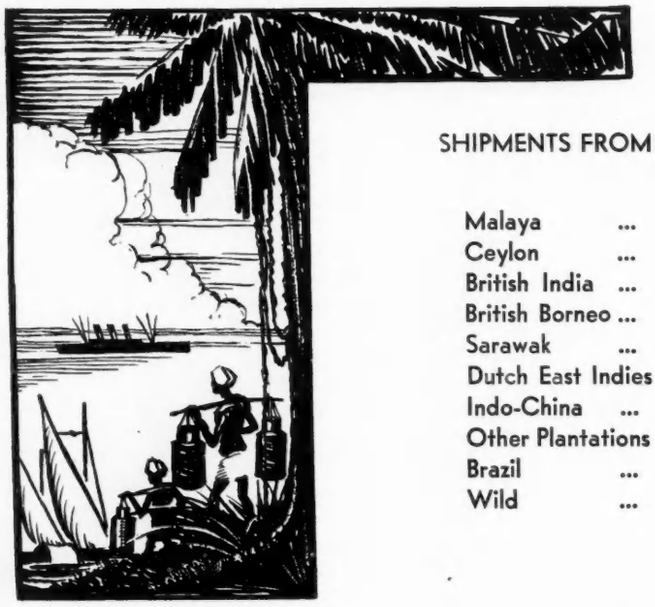
Stocks in the U. S. A. have, in the meantime, increased month by month and amounted at the end of 1930 to 202,246 tons, or practically double what they were a year before.

Rubber producers have been faced with the problem of endeavoring to reduce costs to enable them to work at a profit without at the same time increasing outputs and thus adding to the surplus stock and bringing the selling price down still lower. In conjunction with Dutch producers, arrangements were made whereby a majority of Europeean owned estates and some native owned estates ceased tapping for the month of May. This project was referred to in our last annual review** and it was then thought that this step might be sufficient to restore the balance of supply and demand. Owing to the continuance and deepening of trade depression in America and elsewhere, these hopes were not fulfilled; world consumption showed a heavy decline from 1929 and all calculations were upset.

When the decline in consumption became evident it was recognized that stronger measures were necessary and efforts were made jointly with Dutch producers to bring about some measure of compulsory restriction under the auspices of the British and Dutch governments. The so-called Anglo-Dutch Liaison Committee worked out proposals for submission to their respective constituents and eventually to their respective governments. These proposals were never made public but it was understood that a reduction of

* See Table on next page.

** *Automotive Industries*, May 3, 1930.



Shipments and Consumption,

SHIPMENTS FROM PRODUCING COUNTRIES

	1928	1929	1930	
Malaya	299,000	449,000	438,000	tons
Ceylon	56,000	80,500	75,500	"
British India	11,000	12,000	10,500	"
British Borneo	6,700	6,500	6,500	"
Sarawak	11,300	11,000	10,500	"
Dutch East Indies ...	226,000	259,000	240,000	"
Indo-China	9,000	9,800	8,000	"
Other Plantations ...	7,000	8,000	6,000	"
Brazil	24,500	22,500	16,000	"
Wild	4,500	4,200	4,000	"
Total	655,000	862,500	815,000	tons

something like 25 per cent in output was aimed at until the price should have recovered to 9d. or over.

The Rubber Growers' Association representing British interests were practically unanimous in support of the plan. A meeting of Dutch interests held in Holland in July was not unanimous but showed a majority in favor of the proposals.

The Malayan Government was apparently prepared to proceed with some plan provided the support of the Government of the Dutch East Indies could be obtained and with this object in view Sir Cecil Clementi, governor of Malaya, visited the Dutch East Indies and discussed with Jonkheer de Graeff, the governor general, the possibility of the local government joining the Malayan Government in a scheme of restriction. The Dutch East Indies Government found itself unable to join in a compulsory restriction scheme because;

(*a*) they were unwilling to apply any form of compulsion to the Native population

(*b*) that the Native population themselves did not wish for any restriction

(*c*) that owing to the lack of land registration "*it would be very difficult and scarcely possible*" to apply restriction, and

(*d*) that the Dutch authorities feared reprisals by countries consuming Rubber in the form of increased duties on other products from the Dutch East Indies.

These negotiations, commendable in themselves, had the unfortunate effect of keeping alive the hope that something would soon be done to remedy over-production and while they were going on little if any effort was made to reduce outputs by voluntary means. The publication of the decision of the Dutch East Indies Government brought about a rapid fall and the Spot price which stood at 4¾d. on 1st September had fallen to 3⅞d. by Monday 8th September, and with slight fluctuations continued to fall till 1st October when business was done at 3 9/16d., representing the low point for the year.

The month of October brought news of revived talk in Holland of the possibility of the Dutch Government being induced to reconsider their decision while rumors that the French Government proposed to put a duty on all Rubber imported into France except that from the French Colonies caused extensive buying of near Rubber by French interests.

Various announcements were made by different producing companies and groups of companies indicating their intentions with regard to reduced outputs. These factors helped by a low price brought about a rise which carried the price of Spot Rubber up to 4 13/16d., on 9th December.

This rise, which has since been almost entirely lost, was unfortunate in that it retarded the arrangements in process of being made by estate companies to reduce output and encouraged tapping by the Native producers, particularly in Malaya and Ceylon, with the result that shipments, although reduced, still remained well above the level of the world's requirements.

Production, 1930

Last year we gave the average monthly shipments from Malaya for the first half of 1929 as 33,000 tons and those for the second half as 38,000 tons. Table 2 shows net shipments of Malayan produced rubber monthly for three years. Shipments amounted to 437,771 tons, an average of 36,481 tons per month.

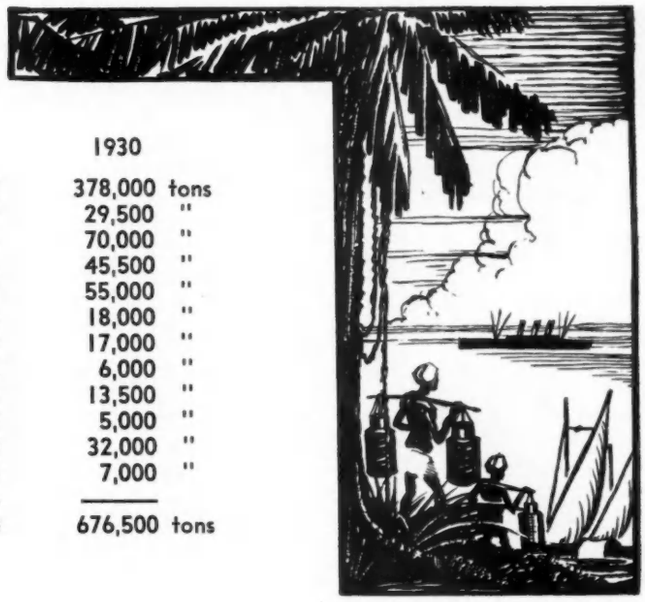
Owing to the May tapping holiday the average for the first half of the year was only 35,851 tons per month while that for the second half was 37,111 tons. Shipments for the months of August, September and October were particularly high. These shipments would consist of rubber produced during July, August and September when hopes that some program of restriction would go through were still running high.

Shipments for November and December showed a sharp falling off which would probably have been even more marked but for the unfortunate rise in price which took place in October and November.

Table 3, of Dutch East Indies exports reduced to dry equivalent, shows the 1928, 1929 and 1930 shipments by months. We give below a more detailed comparison of Estate and Native exports for the past two years:

	Estate Exports	Native Exports (dry equivalent)	Total (dry equivalent)
1929	156,065 tons	102,672 tons	258,737 tons
1930	151,869 tons	87,932 tons	239,801 tons
	Decrease 4,196 tons	Decrease 14,740 tons	Decrease 18,936 tons

1928, 1929 and 1930



CONSUMPTION	1928	1929	1930	
U.S.A.	441,500	480,000	378,000	tons
Canada	31,000	36,500	29,500	"
United Kingdom ...	48,500	66,500	70,000	"
Germany, etc.	43,000	45,000	45,500	"
France	40,000	60,000	55,000	"
Italy	12,000	15,500	18,000	"
Russia	14,500	17,500	17,000	"
Scandinavia	3,500	5,500	6,000	"
Belgium and Holland ...	9,500	11,000	13,500	"
Australia	9,000	15,500	5,000	"
Japan	25,000	35,000	32,000	"
Other Countries ...	6,500	9,000	7,000	"
Total	684,000	797,000	676,500	tons

In order to illustrate the effect of price on the Dutch Native Rubber we give below a comparison of shipments dividing the years into periods of six months each. The figures then show as follows:

	Estate Exports tons	Native Exports (dry equivalent) tons	Total (dry equivalent) tons
First 6 months 1929	79,319	52,392	131,711
First 6 months 1930	74,867	50,165	125,032
Decrease	4,452	Decrease 2,227	Decrease 6,679
	= 5½%	= 4¼%	= 5%
Last 6 months 1929	76,746	50,280	127,026
Last 6 months 1930	77,002	37,767	114,769
Increase	256	Decrease 12,513	Decrease 12,257
	= ¼%	= 25%	= 9¾%

It will be seen from the above figures that so far as shipments are concerned at any rate the price has seriously affected Native rubber. Shipments and production do not however necessarily tally. A large proportion of the Native rubber is of such low quality that it can only be marketed after a remilling process. Low prices make remilling unremunerative and the low native rubber unmarketable.

Consumption, 1929, 1930

	1929		1930	
	Total tons	Per working day tons	Total tons	Per working day tons
January ...	43,002	1,654	36,669	1,410
February ..	41,594	1,733	32,726	1,487
March	44,730	1,720	35,914	1,381
April	47,521	1,828	40,207	1,546
May	49,233	1,894	39,902	1,535
June	43,228	1,729	34,643	1,386
July	41,526	1,597	29,894	1,196
August	38,274	1,472	30,575	1,176
September .	34,807	1,450	25,288	1,011
October ...	34,800	1,338	27,271	1,049
November .	27,659	1,152	23,480	1,021
December ..	23,531	941	21,493	827
Total	*469,905		378,062	

* For reasons given in our last Annual Review we believe consumption totaled 480,000 tons in 1929.

Both in 1929 and 1930 the heaviest consumption occurred in the second quarter. These seem, as a rule, to be the months of heaviest consumption and quite naturally so, as they are the months when the demand for tires is apt to be at its highest.

The heavy falling off in U. S. A. consumption in 1930 is of course explained by the general decline in trade, the first symptoms of which became evident with the collapse of securities in Wall Street in the autumn of 1929. This has affected not only the output of new cars in the U. S. A., which declined from 5,352,445 in 1929 to 3,336,110 in 1930, but has also seriously affected tire replacements.

Visible Supply

We show below our table of visible supply at points where stocks are more or less officially known and have been so known for the past three years:

	1928	1929	1930
Singapore	22,500	28,000	31,500
Penang	10,500	5,200	4,500
United Kingdom	22,500	73,200	118,500
U. S. A.—			
Manufacturers	51,000	63,000	146,500
Dealers	15,000	42,000	56,000
Continent	4,500	6,400	10,000
Afloat	117,500	90,400	81,500
	243,500	308,200	448,500

The above figures show an increase of 140,300 tons in stocks during the year. This figure does not exactly tally with the excess of shipments over consumption shown in Table 1, amounting to 138,500 tons. The following adjustments must be made. We calculate that there is an extra invisible stock of about 5000 tons in factories in the United Kingdom and an additional invisible stock of 10,000 tons in France. American stocks appear to be over-declared to the extent of about 18,000 tons. Taking these items into account the discrepancy very nearly disappears.

The total decrease in output for the year amounts in round figures to 2,000,000 vehicles, equal to nearly 40 per cent. As will be seen from the table the decline, which was already heavy in the early months of the year, became accentuated in the second half of the

year. The total output of motor vehicles for the first half of the year 1930 was 2,192,688, against 3,219,622 in 1929, a decrease of 32 per cent while the output for the second half of 1930 totaled 1,143,422, against 2,132,823 in 1929, a decrease of 46 per cent. The first quarter of the current year will probably show increased outputs, particularly of new models, but sales reports so far received are not encouraging.

Total registration of cars in the U. S. A. at end 1930 as compared with end 1929 show a very slight increase, the respective figures are as follows:

	1929	1930
Cars	23,030,000	23,200,000
Trucks	3,370,000	3,518,000
Total*	26,400,000	26,718,000

*Estimated. (1929, 26,623,857; 1930, 26,746,154, *Automotive Industries*, Feb. 28, 1931, page 293.—Editor.)

We have heard it stated that figures such as these indicate that America is at last reaching the "saturation point" of which so much has been heard in the past. We do not ourselves believe there is any such thing, and a revival in trade when it comes will probably bring with it an increase in car registrations.

American export figures show a very sharp falling off for 1930 compared with 1929.

The Department of Commerce in Washington has recently published a calculation showing the average tire replacement per car for the years 1921 to 1930. These have been as follows:

1921	3.16 tires per car.	1926	2.38 tires per car.
1922	3.36 tires per car.	1927	2.48 tires per car.
1923	2.93 tires per car.	1928	2.50 tires per car.
1924	2.99 tires per car.	1929	2.11 tires per car.
1925	2.80 tires per car.	1930	1.65 tires per car.

Under more normal circumstances one would expect to see an increase in replacements during 1931, particularly in view of the fact that there were in round figures 9 per cent more cars registered at the end of 1929 than there were at the end of 1928 and it is on the year-old cars that replacements can be expected. In the present conditions ruling in the U. S. A., however, one can hardly look for much improvement, particularly in view of the fact that car registrations in the U. S. A. remained practically stationary last year.

The quantity of rubber used per tire and tube continues to increase at a fairly steady rate. In part this is owing to the making of a better tire which incidentally has a longer life but it is also due in part to the increase in the use of giant tires on buses, commercial cars and trucks.

Under these circumstances we venture to appeal to the Rubber Growers' Association to give a lead to producers generally by setting to work to establish at the earliest possible moment conservative estimates of probable consumption for at least two years ahead. In this connection the assistance of the various Trade Associations might well be sought. A great deal of information could be made available by such means.

France Honors Andrew C. Pearson

FOR services to France during the World War, the French Government has made Andrew C. Pearson a Chevalier of the Legion of Honor.

Mr. Pearson is Chairman of the United Business Publishers, Inc., President of the National Publishers' Association, and National Chairman of the American Publishers' Conference.

Though this honor is usually conferred for distinguished military service, it is occasionally bestowed on a civilian.

Left to right:—D. A. Skinner, General Secretary, United States Chamber of Commerce; George Lucas, Secretary, National Publishers' Association; Andrew C. Pearson; Senator David I. Walsh; William L. Daley, Secretary-Treasurer, American Publishers' Conference; Senator Henry J. Allen; Major Georges Thenault, Military Attache of the French Embassy; Congressman Archie D. Sanders.

JUST AMONG OURSELVES

Shoulder to Shoulder On to the Fight

THE automotive industry, through its various associations and through individuals who have given generously of their time and effort, has been putting up a fine, clean fight against the attempts to hog-tie motor transport progress with restrictive legislation and excessive taxation.

Using the powerful sword of education with its sharp blade of specific facts, our industry and its representatives are combating with vigor and effectiveness the phalanx of untruths and half-truths which has been flung against it by rail carrier and kindred interests.

Cause is Grounded on Service to Public

PROGRESSIVE automotive opinion is willing for motor transportation to stand or fall on the basis of its relative economic service to the public. And here our industry is on firm ground, because on this ground and on this ground alone, the final competitive battle is always waged between industries and companies.

The railroads in the long run can hope to meet bus and truck competition successfully only one of two ways: Either they must get enough legislative restrictions removed from their own operations to permit them better to compete on an economic basis—and then compete on that basis—or they must actively utilize the bus and the truck as a part of a competitive coordinated transportation system controlled by themselves.

Certainly the railroads would present a much more intelligent and sensible front were they found fighting for removal of restrictions from their own operations rather than in favor of uneconomic hampering of motor transportation.

Narrow Policies Are Economically Unsound

NO fundamentally sound argument can be based on the idea of protecting existing investments in old industries. The telephone companies, instead of resisting and trying to hamper radio development—a new medium which might eventually cut in on their revenues—fostered growth and led along these new communication lines until now, whatever the future development of radio may be, the major telephone interests stand to profit rather than lose. How much better is the public served in this way than by a long drawn battle between the old and the new!

"The economic progress that has been made possible by the development of automotive transportation cannot be stopped merely because it injures another and older form of transportation," says *Bus Transportation* in a recent editorial. And it says the truth. It says more truth when it continues: "If, as a nation, we are to adopt the philosophy that economic advantages made possible by the development of new methods should be restricted because they represent a possible source of embarrassment to established businesses, then we should lock up our laboratories, abandon research and throw into the street those inventive geniuses who reveal a weakness for developing improved methods and processes."

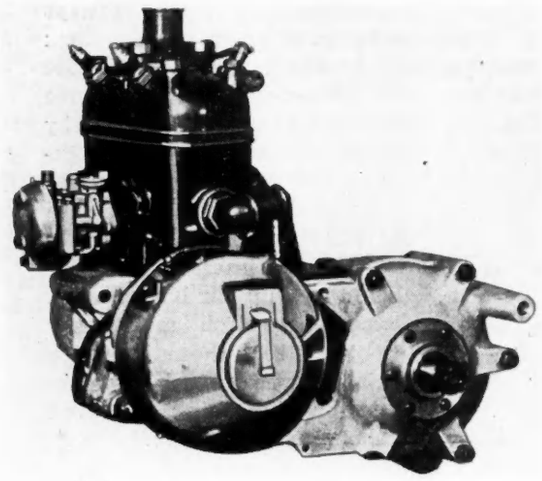
Progress Will Go On in Spite of—

PROGRESS will go on—restrictions or no restrictions. If the truck and the bus offer more economic transportation under certain conditions, all factors considered, than any other form of unit—and we believe they do—they will eventually supplant those other units under those given conditions. The fight against economics must be a losing one in the long run.

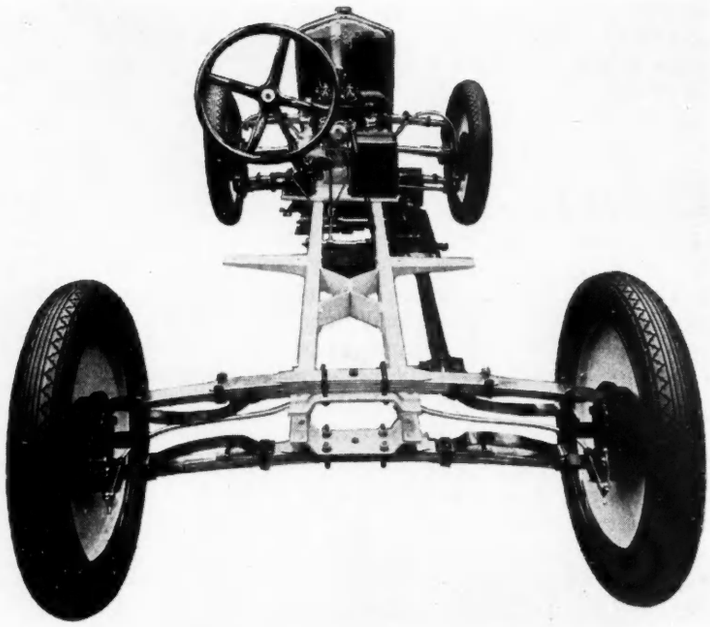
Continued opposition can make conditions hard, even impossible, for existing motor vehicle operators, however, and for that reason every agency in our industry is duty-bound to help sharpen that sword of education and keep swinging it in the cause of fairness as lustily and as constantly as strength will allow.—N. G. S.

Revolutionary Body Designs, Independent and Front Drive at First Berlin Show

Phaeton and closed bodies of the limousine and coach type have lost favor and are being replaced by the convertible type with standing side frames or cabriolet tops in which windows let down and frames fold over the sills



D K W two-cylinder two-cycle powerplant for front-drive small car + + +



D K W front-drive chassis with narrow frame and independent suspension + + + +

THE German international automobile show, which opened in Berlin on Feb. 19, comprises two divisions in two adjacent halls, one consisting of passenger cars, the other of commercial vehicles, parts and accessories. Motorcycles are not shown.

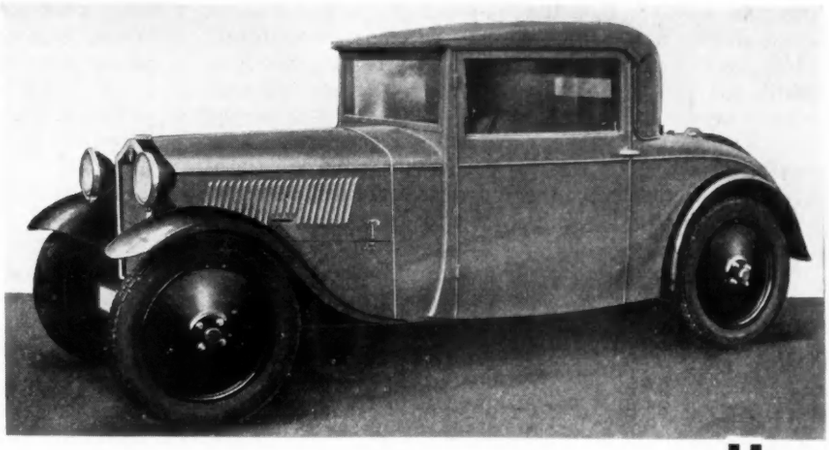
The total number of manufacturers exhibiting in the passenger car section (45) is less by six than the number which were represented at the last previous Berlin show, in November, 1928. Eighteen German makers and 27 foreigners are included. Great Britain is represented at a German automobile show for the first time since the war, by Rolls-Royce and Austin. The number of American makers represented is less by two than at the last previous show, exhibits being made by Auburn, Chrysler, Ford, Franklin, General Motors (Chevrolet, Pontiac, Buick and Cadillac), Graham Paige, Hudson-Essex, Lincoln, Nash, Packard, Studebaker and Willys-Overland. Other countries represented are: Italy (Alfa-Romeo, Fiat, Isotta-Fraschini, Lancia); France (Citroen, Peugeot, Renault, Talbot); Austria (Steyr, Austro-Daimler, Graef & Stift); Belgium (Minerva) and Czecho-Slovakia (Tatra). Several German makers have disappeared since 1928, viz., Aga, Elite, Mannesmann and Selve, while Hansa-Lloyd (not Hansa) has given up passenger-car production.

In the following report I shall confine myself principally to the 28 German models shown that were brought out since the last previous exhibition.

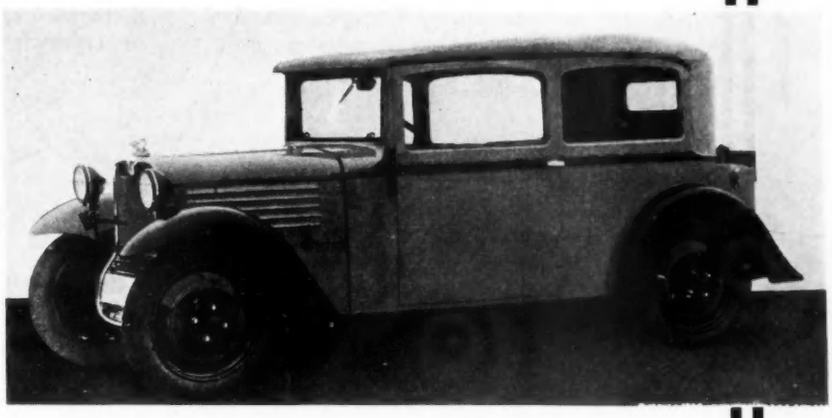
The 1928 show was remarkable for the large number of eight-cylinder cars presented by German makers and for

Suspension in 3 Years

by Edwin P. A. Heinze



D K W front-drive cabriolet



Stoewer front-drive car

the first signs of heavy price reductions, reflecting improved manufacturing methods and policies. While the number of eight-cylinder cars has decreased slightly since then, the lowering of prices has continued, and prices of German cars have reached so low a level that it is becoming very difficult for non-German makers to compete on the German market.

The present show reveals a number of interesting trends in both chassis and bodies. The most characteristic technical developments are an increase in the number of small cars, the introduction of two new front-drive models by well-known makers, the adoption of independent wheel suspension and divided rear and front axles, the growing use of hydraulic brakes and hydraulic shock absorbers, the widespread application (even on cheap small cars) of centralized chassis lubrication, and the popularity of two recently evolved types of four-speed and over-speed gearboxes (Aphon and Maybach). Further significance is lent to the developments in front-drives and independent springing revealed at the show by the known fact that quite a number of German makers are experimenting with these features, as a result of successes achieved with cars with independent suspension by Austro-Daimler, Steyr, Tatra, Roehr and others, some of whom are putting out quite large cars with such suspensions. It would seem that front drive will be introduced first on small cars. Numerous cars are being exhibited with drop frames and with springs arranged not underneath but alongside of the frame side rails. It is interesting to note also that cast iron pistons now have been entirely superseded by light alloy pistons, except on a new Opel model developed in the United States. Many German models carry pistons of the Nelson-Bohnalite type.

In body-work something akin to a revolution has occurred. Phaeton-type bodies have completely disappeared, with the exception of two models in the small-car class. Closed bodies of the limousine and coach type, an outstanding feature in 1928, also appear to have lost in favor. Their place is being taken by the convertible type of body, with either standing side frames or regular cabriolet tops, in which the windows can be let down and the frames folded over on the sills. While the standard bodies of German factories are still slightly angular in form, though decidedly more pleasing than several French bodies shown, those shown by German body builders (of whom a large number have stands at the show) are particularly tasteful, with long curved lines predominating. German body manufacturers have acquired manufacturing rights for a number of British, French and Italian cabriolet mechanisms, retractable roof and other devices relating to convertible bodies, and have come to manufacturing agreements among themselves relative to their German patents, so it may

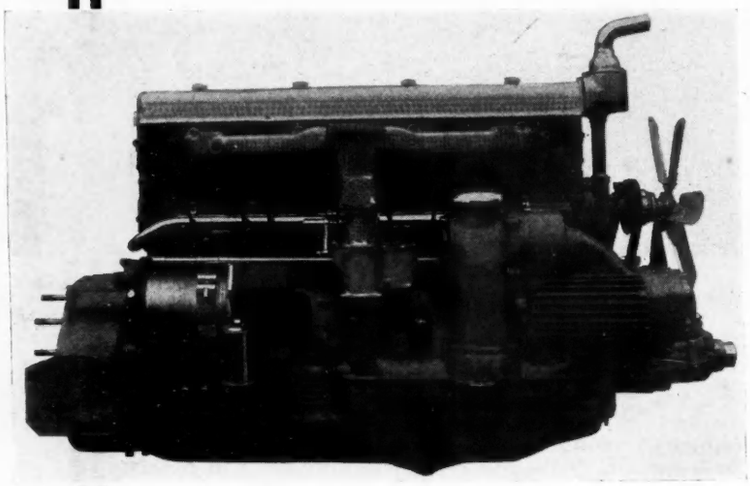
truly be said the best that is available in the present state of the art is here being shown in exceedingly attractive combinations. Conducive to this development are the large number of drop-frame chassis, which permit of a low sweeping roof and give the cars a long, racy appearance, emphasized by the long sweeping surve of the forward fenders, which frequently finds its continuation in the running boards, the rear ends of which turn up into the rear fender. At the back the running boards join the body sides in a curve, so as to avoid a sharp corner in which dirt could collect. In some cases running boards are dispensed with; in others, where spare wheels are carried in fender wells, these are provided with aprons covering the wells and the steering arm.

Color schemes are subdued, light delicate hues, such as cream and buff, being preferred. However, for limousines and other closed cars with rolling or sliding tops (which are few in number) black and very dark blue are employed. There are several cabriolets with six windows at the show, which is unusual, as in the past great difficulties have been experienced from lack of sufficient rigidity and consequent rattling of such long tops.

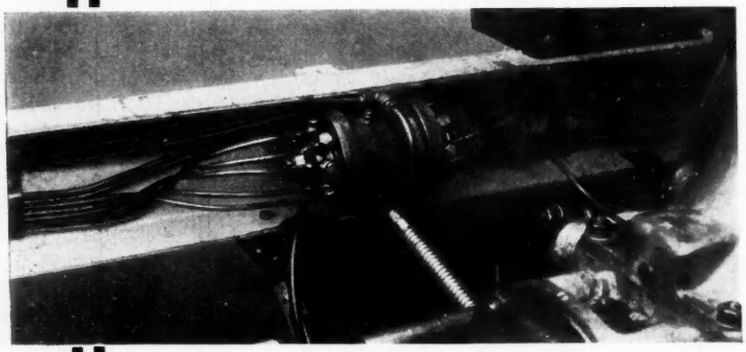
If small cars are defined as those of less than 91.5 cu. in. piston displacement there are no fewer than 10 German models in this class at the show, of which four are new. The old one-cylinder Hanomag with its unconventional body has disappeared, as have the 30 and 36 cu. in. DKW two-stroke models with rear drive. The places of the latter have been taken by a front-drive model and a two-seater sports car with a high-efficiency 31 cu. in. two-cylinder engine and rear drive. Both models are rather smart in appearance. The new DKW front-drive car has a chassis with two longitudinal channel members turned back to back and about 1 ft. apart. This car is supplied in two body styles, an open two-seater with sports type top being offered at the very low price of $400. The second car, having a 36 cu. in. engine and a roadster-cabriolet body, sells at only a few dollars more. These cars are among the chief centers of attraction at the show. The chassis has a water-cooled, two-cylinder, two-stroke engine with a starter-generator on the crankshaft, the unit being set crosswise on the frame. Clutch, three-speed gearbox and differential case are bolted to the engine, and drive shafts extend from the differential on both sides to the front wheels, which, like the rear wheels, are suspended between two transverse springs arranged one above the other. The shafts, of course, have universal joints near the gearbox and two joints at the wheel end. The engine is rated at 15 b.hp. at 3200 r.p.m.

Another important new small car is the front-drive Stoewer with a water-cooled, four-cylinder, four-stroke V-engine developing 25 b.hp. This is a more pretentious vehicle with a large, comfortable four-seater body having a folding fabric roof and standing side frames. It is the most expensive of these small cars, its price being $855. Like the DKW, it has independently sprung wheels, but in this case there is only one transverse spring, above, the place of the lower spring being taken by radius rods. A third small front-drive car may be mentioned. It has been designed by von Stietencron, one of the pioneers of the front-drive movement. Only one experimental model has been built so far, and the exhibitors's object is not to sell to the public but to interest manufacturers in licensing arrangements. The driving mechanism is similar to that of the Stoewer.

A further newcomer in this class is an Audi with rear-drive and four-cylinder engine of 67 cu. in. piston displacement. This is offered as four-seater two-door sedan at $800. The engine develops 30 b.hp. The other small cars were shown in 1928, but, of course, most of them have been considerably improved. Thus the four-cylinder two-stroke DKW and the four-cylinder four-stroke Hanomag have had their piston



Mercedes eight-in-line engine with supercharger + + + + + + + + +



Mercedes chassis lubricating pump driven through an extension of the speedometer driveshaft at 1/30,000 engine speed + +

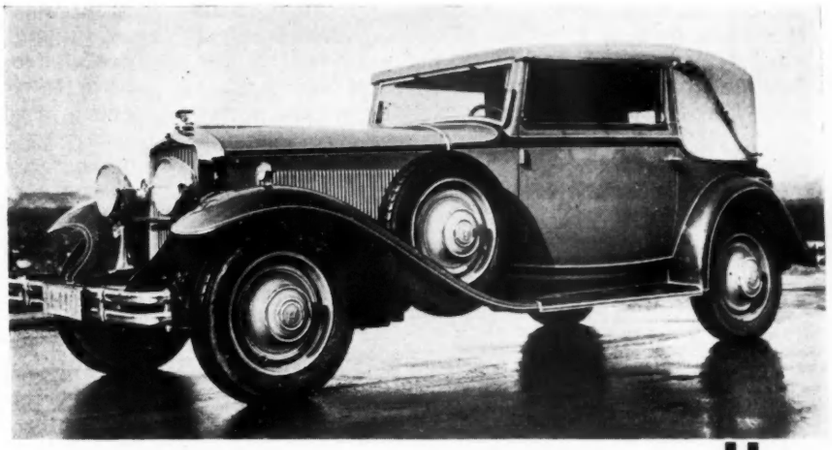
displacements increased by 12 cu. in. to 61 cu. in., and the DKW body has been increased in length and width. The small Opel four-cylinder has a new cylinder head, which increases the engine output by almost 25 per cent, to 25 b.hp., and the BMW (built under Austin Seven license) now has a larger body and a transverse spring taking the place of a rigid front axle center.

All of these small cars carry excellent stock equipment. The four-cylinder DKW, Hanomag, Audi and Stoewer have hydraulic brakes and several of them have hydraulic shock absorbers. All carry a spare wheel with tire, direction indicators, electric windshield wipers, etc. The Hanomag also has centralized chassis lubrication. The BMW sedan has a rear curtain that can be operated from the driver's seat.

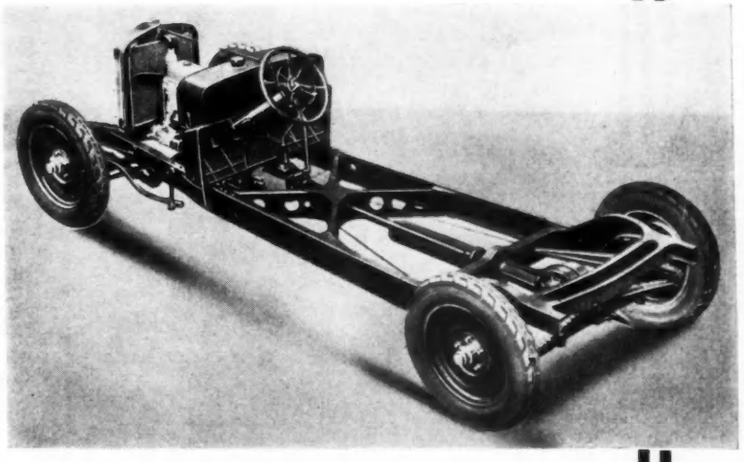
In the class up to 2000 cc (122 cu. in.), there are six models, two of which are new. Three have four-cylinder and the remainder six-cylinder engines. All of these cars are high-class jobs. Prices in this class have been reduced materially, by more than $100 in some cases. The lowest priced model in this class is the new 110 cu. in. six-cylinder Opel which was developed in the United States by General Motors in collaboration with German engineers. This exceedingly attractive and well-equipped car is being sold in Germany at $750 for the two-seater cabriolet-roadster and at $800 for the two-door sedan. It, too, forms one of the chief centers of interest at the show and promises to become the most popular car of its class in Germany. The other new car in this class is the four-cylinder Brennabor of 100 cu. in. piston displacement, but the two-door sedan costs $940. The six-cylinder Daimler-Benz (Mercedes) Stuttgart, which has been improved by a new cylinder head, and the small four-cylinder Wanderer and the six-cylinder NSU are considerably higher in price, while the four-cylinder Adler is priced about the same as the Brennabor but has a larger engine and body.

In the class with between 122 and 183 cu. in. piston displacement, German makers exhibit seven six-cylinder and two eight-cylinder models, four of the former and one of the latter being new since 1928. This group comprises two Adler six-cylinder models, one new six-cylinder Brennabor, a new six-cylinder Mercedes, a new six-cylinder Hansa with Continental engine, a new six-cylinder NSU (which is the German version of a well-known Fiat model), a new Stoewer Eight, a Wanderer Six and a new Roehr Eight. The maker of the latter, after being on the verge of bankruptcy, found new capital and will continue.

The Brennabor line, comprising the six-cylinder model here mentioned, the four-cylinder of the preceding class, and an eight-cylinder car in the class up to 244 cu. in., are so designed that most of their parts are interchangeable, the bores and strokes being the same in all. A feature is that the cylinder heads always cover two adjacent cylinders, which makes for small cylinder gaskets. All models have drop frames (in the four-cylinder model at an extra charge) and Silentbloc spring shackles. What remains of chassis lubrication points has easily accessible grease nipples. The brake shafts of all Brennabor models are mounted in flexible roller bearings.



Horch cabriolet



Steyr chassis with trussed frame and independent rear suspension + + + + +

A new car of interest in this group is the Hansa Matador. It has a triangular frame running to a point at the rear where the differential gearbox is secured to it. The rear wheels are mounted on triangular struts, the bases of which are hinged to the frame in rubber bearings. The wheels are driven by short shafts from the differential and suspended by a transverse spring. A single-plate clutch (now used by all makers in Germany), a four-speed Aphon gearbox, an automatic back-roll stop, centralized chassis lubrication, and a solid front axle with reverse Elliott steering heads are the features of this model.

The Daimler-Benz (Mercedes) car in this class is very similar to the smaller one previously mentioned

but has an engine of 158 cu. in. A feature of all Mercedes models is a chassis lubrication system worked by a small, ingenious pump driven off the free end of the speedometer drive on the gearbox with a reduction ratio of 30,000 to 1. The pump draws oil from the engine sump and forces it at a pressure of 170 lb. per sq. in. through calibrated orifices to all chassis bearings requiring lubrication. At an extra cost the above model is supplied with a Maybach overspeed gearbox, which is standard in the larger models. All Mercedes cars (as well as many other German makes) have screw-and-nut steering gears in which the steel nut is lined with white metal. The smaller Mercedes models have internal band brakes combined with one shoe intended mainly for checking reverse motion. The larger models have internal shoe brakes, which are double on the rear wheels, one set being actuated by handlever.

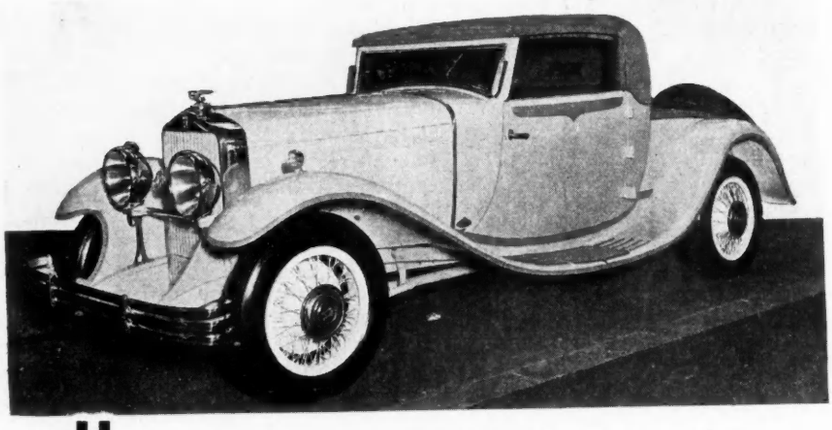
The 8-cylinder Stoewer in this group has a piston displacement of not quite 183 cu. in. and carries a Schebler carburetor. The downdraft carburetor, by the way, does not yet seem to have found favor with German designers, though one or two make the attempt to achieve a similar result by using a U-shaped air inlet pipe with air cleaner attached. In only one case is a genuine downdraft carburetor being employed, in a new NAG, in which, however, its superiority is nullified by attaching a long horizontal hot-air pipe to it. In the Stoewer cars, which employ the Hotchkiss drive, rubber shock insulators are used on the springs; most other large German cars have torque tubes. Stoewer cars also are exceptional in being the only ones having a separate oil radiator mounted behind the water radiator. An engine oil filter, hydraulic brakes, hydraulic shock absorbers, and thermostatically controlled shutters are likewise provided. As regards the latter feature, many German designers prefer hand-controlled shutters in conjunction with a dash-mounted thermometer.

The Roehr car, while retaining the same main features as in 1928, namely, independently sprung front and rear wheels and a wide frame with body floor attached to the under side, has a new eight-cylinder engine of 150 cu. in. piston displacement, in which the cylinder bores, while in one block, have their axes in two planes making a small angle with each other. The arrangement, of course, gives a short single-block engine.

In the 244 cu.-in. class ten German models are shown, one "four," five "sixes" and four "eights." Six of these are new. It is interesting that Hansa has brought out a new four-cylinder car, the Consul, evidently with a view to competing with Ford. Having a large body and a well-designed and efficient L-head engine it costs only a few dollars higher than the Ford model A. It has hydraulic brakes and shock absorbers that automatically adjust themselves to climatic conditions. The same car can be had also with a somewhat smaller engine, to reduce the tax payable on it. Other new cars in this group are an Audi with a six-cylinder L-head engine similar to the old Rickenbacker, a Mercedes, which can be had in various lengths of wheelbase and with either a 214 or a 224 cu. in. engine, a Horch eight with two overhead camshafts, which the makers are discontinuing in their newer models, and a low-frame six-cylinder NAG with automatic clutch of the type introduced in 1928.

In the 5 litres (305 cu. in.) group there are six eight-cylinder models of which four are new, the most notable one being the NAG with V-type engine, a downdraft carburetor, a compression ratio of 5.7 to 1, Aphon four-speed gearbox, drop frame, springs outside of frame, centralized lubrication, torque tube and banjo-type rear axle. Two new Horch models have valve-in-head engines with a single overhead camshaft as previously indicated. The cylinder block is now cast together with the upper half of crankcase, and the bore has been increased

Neuss sleeping cabriolet on Adler chassis. The double-door, which opens either forward or backward, has been taken down + + + +



Kellner cabriolet on Horch chassis. This shows the new running board treatment favored by German designers + + + + + + + + + +

while the stroke has been reduced. In the smaller of the two models the bore is now 87 mm. and the stroke 95 mm. (3.425 by 3.740 in.).

In the largest class there are six models of between 312 and 487 cu. in. These include a new Audi with eight-in-line, L-head engine of 312 cu. in., the new supercharged Grand Mercedes which made its debut at the Paris show, and two new Maybach cars with twelve-cylinder engines, which are identical except for the one having 427 and the other 487 cu. in. displacement, the respective ratings being 150 and 200 b.hp. Another newcomer in this class is a Simson-Supra straight eight of 284 cu. in. displacement and 90 hp. rating. Two thermostats are employed, one controlling the shutters, the other the water circulation.

Of non-German cars the 122 cu. in. Renault commanded the greatest interest at the show, not on account of any unusual technical qualities but owing to the price, the car being offered at $800. It has been charged that this constitutes dumping, inasmuch as the cars have to be imported complete and about $250 in import duties must be paid on them.

Of considerable technical interest was the Steyr XXX model with six-cylinder valve-in-head engine of 122 cu. in. displacement, since a direct comparison could be made on the stand with the old model of the same size. The old engine had an overhead camshaft, a ball-bearing crankshaft, and magneto ignition. In the new engine the crankshaft has eight plain bearings, the camshaft drive gear being located between the two rear bearings. The camshaft now is located inside the crankcase and operates the valves through pushrods and rockers. The makers claim this has made the engine much more quiet. Battery ignition has been adopted. A feature of special interest is the silumin diecasting of the cylinder block integral with the crankcase upper half. This is an important innovation, as hitherto it was considered impossible to die-cast such large pieces in light alloys. Normal cast iron liners are inserted, and Nelson-Bohnalite pistons with two scraper rings are employed. The transmission now has three instead of four speeds. The oscillating rear axles are pivoted in an inclined plane and mounted in Silentbloc bearings. The differential gear and the engine also are rubber-mounted. The screw of the screw-and-nut steering gear now has two leads instead of a single one and is chromium plated, and the cast iron nut is lined with white metal. Hydraulic shock absorbers and hydraulic four-wheel brakes are now standard equipment, and these and other modifications have reduced the chassis weight by 440 lb.

Some interesting new parts are also shown. The Siemens-Schuckert Works have developed a new combined generator and starter to be either direct-connected to the engine crankshaft or provided with gear-drive. It is claimed that, owing to the elimination of a separate starter, the unit can be made of liberal size, and it has an output of 300 watts. The Bosch company has introduced a new combined battery and magneto ignition set. The generator is separate, while the magneto carries two distributors, for magnet and battery sparks respectively. The Bosch-Dewandre vacuum brake booster, which is used on many of the larger German car models as well as on trucks and buses, has been simplified by separating the valve part from the cylinder, which can now be drawn in one piece, thus making it a better manufacturing proposition. The company now also markets a fog lamp with rays directed downwards. This lamp is meant to be fitted between the regular head lamps. Another innovation is to be found on new models of Bosch starters. In these the starting pinions are engaged mechanically by a linkage connected to the starter button in such a manner that when the latter is pressed down the pinion is first shifted into mesh and then the current is switched on; the pinion remains in mesh until the starter button is released. The Fichtel & Sachs Co. has extended its operations by taking up the manufacture of Komet Mecano "superelastic" single and double-disk clutches, the feature of which is that they are provided with counter springs which prevent too sudden engagement by the main spring. The same maker also produces one-way and two-way hydraulic shock absorbers comprising a valve which automatically compensates for changes in atmospheric temperature.

Novel tubular seat used in Stoewer front-drive small car

Effect of Width of Wheel on Cylindrical Grinding Costs

LABORATORY tests to determine the effect of the width of wheel on cylindrical grinding costs as reported in *Grits and Grinds*, November, 1930, give rise to the following conclusions:

"1. The total cost, including overhead, of cylindrical grinding decreases as the width of the wheel increases.

2. Grinding by the plunge-cut method represents the maximum economy for the operation involved in this test.

3. The major factors in determining cylindrical grinding costs are obviously those of labor and time.

4. A greater saving is effected in traverse grinding between a 4 in. and 2 in. wide wheel than between a 9 in. and 4 in. wheel."

"The application of these results depends upon the size of piece and the method in which it can be supported in addition to the labor and overhead costs. In many cases, the piece itself will limit the width of wheel, but these results do show how economies in grinding costs can be effected."

Specific Output of Engines Has

Elwood Haynes in his first car built in 1893, which is now in the Smithsonian Museum in Washington + + + + + + + + +

by P. M. Heldt *

OCCASIONALLY we hear the remark made that there has been no fundamental development in internal combustion engines since the earliest days of the automobile. In a general way this is true. We still use the same fuel, gasoline, and we burn it in the engine cylinders in the same way, in accordance with the Otto-cycle, as did Duryea and Haynes, the pioneers of the American automobile industry. All of the principal parts of the engine (the cylinder, piston, connecting rod, crank, etc.), remain basically the same—and yet there has been tremendous progress in engine design.

As is generally known, the automobile industry in the United States received its first impetus from the *Times-Herald* race, which was held in Chicago on Thanksgiving Day, 1895. At that time Europe had a lead of at least a year on us in motor vehicle development, and while there was strong European competition in the Chicago contest, an American car, the Duryea, proved the winner. It completed the 55-mile run in something over 11 hours, over roads covered with about 6 in. of hard-frozen snow, which in those days, when non-skid chains were unknown, was a great handicap.

From 1895 to 1900 the gasoline automobile passed through its experimental stage. As a rule, a single car was built at a time, and the design often was changed while construction was in progress, if, indeed, there was a completed design when building operations began.

It occurred to me that perhaps the best plan to visualize the progress which has been made in gasoline engine design during the past 30 years would be to give a sort of word picture of a composite automobile engine of the five-year period referred to.

Strangely enough, the Duryea car which won the *Times-Herald* race in 1895 had a three-cylinder engine, whereas practically all other American automobile engines of the period had either one or two cylinders. All of the engines, or at least very nearly all, were of the horizontal type. The choice of the horizontal construction and of a small number of cylinders was undoubtedly due in part to the fact that practically all stationary internal combustion engines of the period were horizontal and had a single cylinder, and it was also influenced by the fact that the pioneer designers of horseless carriages considered it necessary to locate the engine under the seat of the vehicle, with as little as possible of the mechanism showing, so that the outward appearance of the car would be substantially identical with that of the buggies and other horse vehicles of the day. A form of body known as the dos-a-dos was quite popular with designers of that time, because with two seats back to back there was about twice as much room as under a single phaeton seat, and it was not necessary to crowd the propelling mechanism so much.

The choice of engines with a minimum number of cylinders was prompted also by economic considerations. When interest in motor vehicles was first aroused here, the country had only just begun to recover from the severe financial panic of 1892. The United States was not then the same wealthy country that it is now, and money was exceedingly "tight."

* Paper read before the Buffalo Section of the S.A.E. on March 3, 1931.

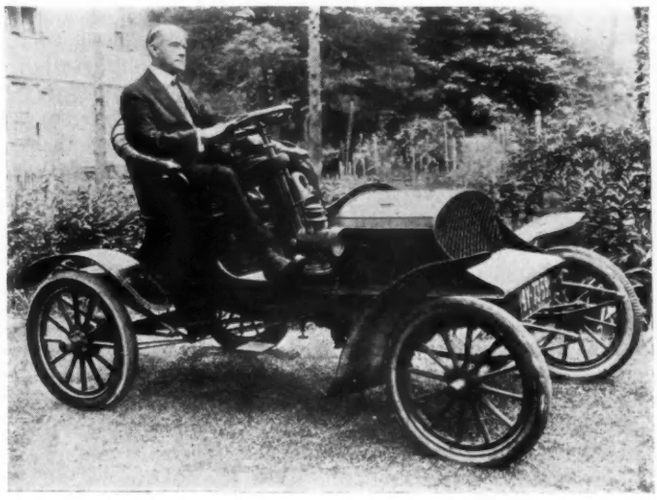
Increased 400 per cent In 30 Years

The most remarkable development in connection with the automobile-type engines has been the great increase in operating speed without attendant increase in noise and vibration

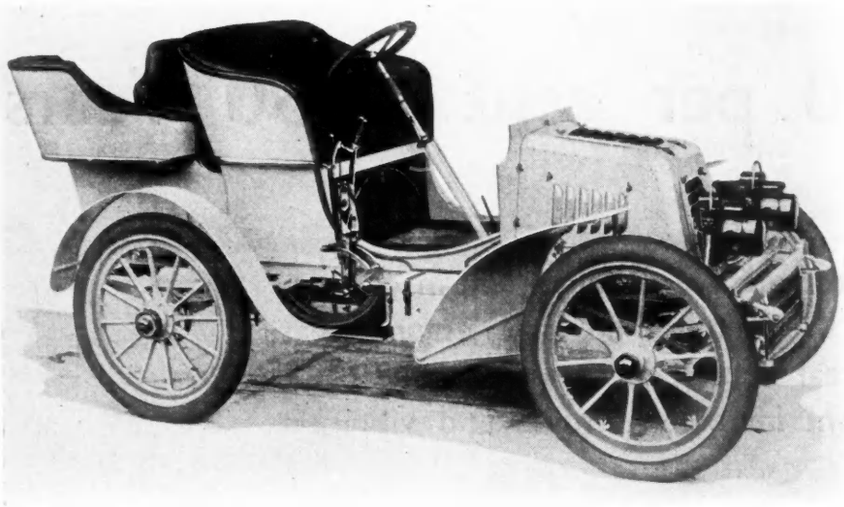
A dos-a-dos car of the "gay nineties" period. This type of body afforded plenty of room for the powerplant + + + + + +

Most of the pioneer promoters of the motor vehicle thought of it as a substitute for the horse and buggy. I remember that in those years buggies—perhaps not the best—were being offered in mail-order catalogs at $36, and good horses sold in the Middle West for less than $100, so it is obvious that to compete successfully with the horsed vehicle the automobile had to be offered at a comparatively low price. Most of the moderate-sized early vehicles, such as the Winton and Haynes-Apperson, sold at from $1,000 to $1,200. When one considers that such machine shop equipment as high-speed tool steel, multiple-spindle drills and boring machines were unknown, or were found only in a few of the most progressive shops, and that crankshafts had to be machined up from solid slabs of steel equal in section to the overall dimensions of the finished shaft, it will readily be seen that it was essential to aim at the utmost simplicity in design.

At the present time we are in the habit of dividing gasoline engines into L-head, T-head and valve-in-head types, and all engines now used for automobiles have vertical cylinders. Most of the early engines were horizontal and had the valves arranged in pockets which were cast either on the cylinder head or on the cylinder block. Cylinder heads were then always cast separate from the cylinders, the joint being packed with sheet asbestos with copper wire inserts. As I remember it the cylinder walls in these early engines were generally about ½ in. thick, and by coarse turning of the joint surfaces and using shellac in alcohol to stick the gaskets to one of the surfaces, a fairly durable joint was obtained. Later, as cylinder walls were made thinner to reduce engine weight, these gaskets no longer gave satisfactory service, and the period from that time until the introduction of the copper-asbestos gasket was marked by the use of heads cast integral with the cylinders.



The first Franklin car with four-cylinder air-cooled engine mounted transversely across the frame in front + + + + + +



A rear-entrance tonneau. This type of body was little more satisfactory than the dos-a-dos and did not survive long + + + + + + + + + +

In comparing the powerplants of this early period with our present designs it strikes me that the greatest advances have been made in connection with the four auxiliary functions of the engine—carburetion, ignition, lubrication and cooling. With carburetion we may include speed control. All of the internal combustion engines built up to the time marked by the advent of the automobile were essentially constant speed engines, and they were governed on the hit-and-miss principle. Full charges were taken into the cylinder under all conditions, and if the load was light, a centrifugal governor acted on the exhaust valve mechanism, preventing lifting of the valve during such a proportion of the total cycles that the desired average speed was maintained. It was realized from the beginning that throttle control was needed for an automobile engine, and it was, of course, easy enough to introduce a throttle valve in the inlet passage. The only difficulty was that when the rate of air flow was thus varied, the mixture proportion also was changed, and if the engine was severely throttled the mixture became so lean that it would not ignite and the engine would stall.

The carburetor as we know it today was unknown in this country during the period referred to. A so-called mixing valve was used in its place. All of the early automobile engines had automatic inlet valves. These were poppet valves that were held to their seat by a light spring and which opened automatically under the effect of cylinder action. There usually was an additional suction-type poppet valve somewhat further back in the intake line, and the gasoline entered the intake passage through an orifice debouching at the seat of this valve, which was controlled by a needle valve. The fuel tank was located above the engine, and there was therefore always a gravity head on the fuel-discharge orifice. When the engine was shut-down the poppet valve closed the fuel orifice. Throttle control of the engines was attempted from the beginning of the automobile era, but since the mixture proportion changed with the throttle position, the range of control was necessarily very limited. It is interesting to mention that Winton used a compressed-air control system which acted directly on the automatic inlet valves. The compressed air assisted the valve spring and when the air pressure was increased the inlet valve closed earlier, thus throttling the engine.

Ignition of all of the early engines was by the electric make-and-break system. A pair of electrodes—one stationary, the other movable—were carried in a flanged fitting bolted over an opening in the cylinder wall, the contact points of the electrodes being on the inside of the combustion chamber. The stationary electrode was usually insulated with mica, while the movable electrode was carried directly in the flanged fitting and was therefore grounded. By a suitable mechanism operated by a cam on a half-time shaft, the two electrodes were first brought in contact inside the cylinder and a moment later were separated, at which time a spark passed between them. The electrical circuit included, in addition to this make-and-break mechanism, a battery of primary electric cells, a spark coil and a switch for shutting down the engine. The coil consisted of a core of soft iron wires over which were wound several layers of about No. 15 cotton-covered copper wire. Wet primary cells were used, but they were generally unsatisfactory, being heavy, breakable, sloppy, and sometimes giving off corrosive fumes. The earliest engines had no means for varying the spark timing while the engine was running, but it was not long before such timing means were adopted, and automatic spark timing was introduced on one or two makes as early as 1900 or 1901.

Primitive Means of Lubrication

Engine lubrication was by the most primitive system imaginable. One oil cup of comparatively large size was mounted on top of the horizontal cylinder and provided lubrication for the piston, and I remember being instructed that the boss for this oil cup must be so located that it would not be uncovered by the piston on its instroke. Engine main bearings were lubricated by screw-down grease cups, and for the crankpin bearing another oil cup was mounted on top of the crankcase and provided with a short wick. A drop of oil would form at the bttom of the wick and would be picked off by a quill on the head of the connecting rod, whence it was supposed to flow through a radial hole to the bearing surface. Crankcase dilution was unknown in those days.

The modern radiator also had not yet been invented. Stationary engines were cooled either by letting hydrant water run through their jackets, or else by connecting the jackets to a cylindrical tank through which the water circulated by gravity or by thermo-siphon action. Most of the early cars also had water tanks located above the engine, through which the water circulated by thermo-siphon action. The tanks were generally made flat, so they would have more surface in proportion to their contents, and they were

located in an exposed position on the car. Naturally, the cooling capacity was insufficient, as a rule, but since the cooling medium was widely distributed, one could, of course, always change the supply. Ice was carried in the cooling system of a contest car in at least one instance. The first step forward consisted in providing the tank with air tubes through it, to increase the cooling area, and later came the gilled tube which was bent back and forth in a coil located at the front of the car. This type radiator, being located at or below the level of the engine cylinder, necessitated the use of a circulating pump.

Automobile engines have always been referred to as high-speed engines, but the conception of the term "high-speed" has changed greatly during the past 30 years. The speeds of the early engines were seldom above 600 r.p.m. A compression ratio of 4 to 1 was common. The gasoline marketed at that time was very volatile and therefore had good anti-knock qualities, so that this compression ratio could be used in cylinders of quite large dimensions without trouble. The largest cylinder bore used in passenger car engines was about 5½ in.

Considerable success was achieved with single and double-cylinder opposed engines in passenger cars from 1900 on, among the most popular cars in this class being the Winton, Oldsmobile, Cadillac and Buick. Foreign manufacturers from about 1895 on had used vertical engines, generally located in front under a bonnet, and from 1903 on vertical engines with four cylinders began to play a role in the American automobile industry, such cars as the Locomobile gasoline car and the first four-cylinder Packard being brought out during that year. By that time the float-feed carburetor with supplementary air valve had been developed, and ignition by jump spark had been introduced, current being supplied either by dry cells or by a storage battery. The dry-cell battery was fairly satisfactory on single and double-cylinder engines, especially with the so-called open-circuit interrupter, which was very economical of current, but it became exhausted too quickly when the cylinder number was increased to four and engine speeds went up at the same time. Storage batteries, of course, also were none too satisfactory, as the modern home-type recharger had not yet been developed and the battery had to be taken to a charging station quite often. So about 1905 magnetos came into use gradually. The first ignition magnetos generated low-tension electrical impulses which were stepped up to the high tension necessary for a jump spark in a separate coil. The true high-tension magneto, in which a high-tension impulse is generated directly in the armature, was introduced in this country in 1906.

When vertical engines were adopted the primitive engine lubricating system previously described was replaced by the circulating splash system. At first there was a good deal of trouble from overoiling of the cylinders and consequent fouling of the spark plugs, and I remember that, when reports of the Paris Automobile Show of 1903 were received in this country, one of the interesting novelties reported upon was a device which overcame trouble from fouled spark plugs. This was the so-called auxiliary gap device, which later was extensively used in this country, but passed out again with improvement in oiling.

At the present time automobile engines with one or two exceptions employ pressure lubrication. This has been used on some high-class engines for a long time—the Pierce-Arrow, for instance, had it as early as 1904—but the cost of such a lubrication system is considerably greater than that of the splash system and it has taken a quarter of a century and the more drastic demands with respect to lubrication of high-speed operation to enable the pressure system to penetrate the whole industry.

Popularity of Four-Cylinder Engines

Four-cylinder engines were for a long time the feature most characteristic of high-grade cars, the same as "eights" were some years ago, although it was not customary in those days to display the cylinder number on the radiator. Human nature was not much different a generation ago, but usually the length of the bonnet was a fairly accurate index of the number of cylinders below it. In the early four-cylinder engines the cylinders were usually cast singly or at most in pairs. The first American car to have a "block-type" four-cylinder engine was the Chalmers 30, in 1908. Some sales resistance was expected introducing the block-cylinder-type of engine, as with the imperfect cooling and lubricating systems of the time, cylinder bores often were scored, and jackets were damaged by freezing, either of which mishap with a block-cast engine meant the replacement of the whole block. To meet this situation the Chalmers company offered to furnish completely machined replacement blocks at $35.

Napier in England had boomed the six-cylinder engine for years, and about 1906 the first American makers adopted this type. The six-cylinder represented the most advanced type until 1914, when the Cadillac company, which had been manufacturing four-cylinder cars up to that time, passed by the six and adopted a Vee type of eight-cylinder engine.

With the increase in cylinder number, and the accompanying reduction in cylinder size, there had been a gradual creeping up of engine speeds, although this development was rather slower in this country than abroad, where automobile markets seemed to be influenced more by racing successes than they were here. The Cadillac eight-cylinder of 1914, which had a peaking speed of 2400 r.p.m., was considered a very high-speed engine for the period, most American automobile engines then delivering their maximum horsepower at 1600 or 1800 r.p.m.

The gradual increase in speeds, of course, brought with it troubles of various kinds, and this led to changes in design intended to overcome these troubles. About 1914 aluminum pistons were introduced. The innovation was not an instant and complete success, with seizure due to excessive expansion threatening on the one hand, and piston slap and oil

Times-Herald race winner in 1895 had a three-cylinder engine.

Carburetors were evolved from "mixing valves" on the early models. Automatic spark timing was introduced about 1900.

High tension magnetos were first used in this country in 1906.

Helical gears were first initiated to the automobile in 1908.

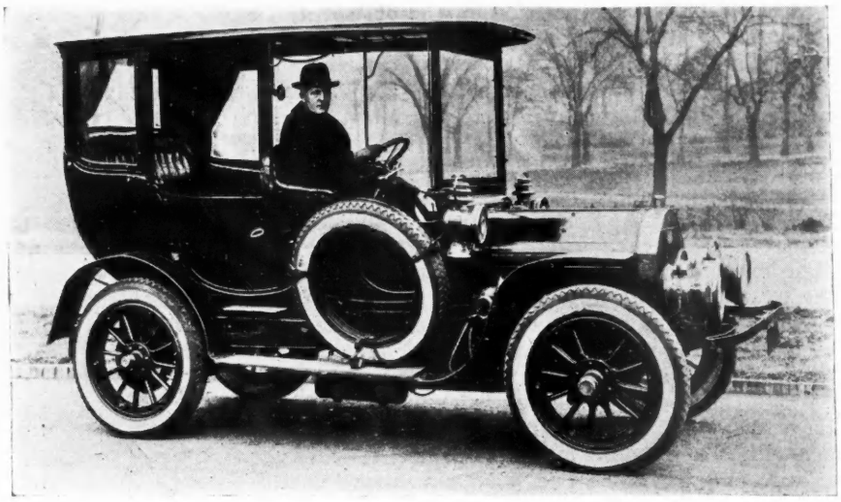
The electric self-starter made its debut in 1911.

pumping on the other. More than one of the first makers to try these pistons went back to cast iron, for a time at least. The oil pumping troubles experienced in those days led to the use of oil scraper rings, with holes through the bottom of the ring groove throug which the oil could return to the crankcase.

With the increase in cylinder numbers and in engine speeds, troubles from torsional vibration began to appear. One of the manifestations of such vibrations was noisy operation and even failure of the front-end gears. All of the early vertical engines had metal camshaft gears, usually a steel pinion and a cast-iron gear. These, of course, were always more or less noisy, but the owners of the earliest cars were generally satisfied if they could keep them running and did not mind the noise so much. A definite move toward greater silence in operation was made when Charles Y. Knight introduced his sleeve-valve engine. This engine was first evolved in 1905, but it was only in 1908 that the first car fitted with it was placed on the market in England, and three years later that the first American car with this engine, the Stearns, appeared. Potential competition from the new sleeve-valve engine compelled designers of poppet-valve engines to quiet their camshaft drive. The first step in this direction, which had been taken as early as 1908, was to cut the metal camshaft gears with helical teeth. Then, in 1911, non-metallic gears of Micarta or compressed cotton were adopted by some makers, and later others followed the lead of Knight in using toothed chains for the front-end drive. As the length of crankshafts increased with the cylinder number, torsional vibration troubles became more and more pronounced, and as a result the chain drive replaced the gear drive for camshafts more and more, as the slight flexibility of the chain seems to afford better protection against excessive stresses due to such vibration.

It was in 1914 that Lanchester announced his torsional vibration damper. This was first used in this country the following year on the Packard 12-cylinder engine, and its use later on became quite extensive on engines of six or more cylinders, until during the past few years other types of dampers were developed.

Up to 1909 all engines were cranked by hand. The lack of self-starting properties of the gasoline automobile had always been considered a handicap, its two early rivals, the steam car and the electric vehicle, both being self-starting. The first self-starters to come into use were of the compressed air type. Acetylene starters were also used. With these a certain amount of acetylene gas from a tank carried for lighting purposes, was allowed to flow into the engine cylinders, and sparks were then produced in the cylinder whose piston was on the firing stroke, by closing the switch. The compressed air starter was open to the objection that it did not have sufficient reserve capacity if the engine was "balky," and the "gas" starter gave a lot of trouble from the fine orifice of the acetylene nozzle in the cylinder clogging up. The electric starter, introduced on the Cadillac car in 1911, finally became standard equipment on all cars. This led to a return to battery ignition for passenger cars, which latter just previous to the advent of the electric starter had practically all carried magnetos.



One of the first side-entrance tonneaus with front-mounted vertical engine, and with canopy top and glass front. The spare-tire carrying problem was still awaiting its solution

During the years 1915-1918 automobile engine development stagnated to a considerable extent, but on the other hand, much development was carried on in connection with aircraft engines, which development in the end proved of advantage to all types of internal combustion engines. It can be said without reserve that at no other period during the history of the internal combustion engine has research relating to its fundamentals been carried on with such vigor as during the war period.

Less Weight per Horsepower

The great aim in aircraft engine development was, of course, to obtain greater output from a given weight. This could be achieved by increasing the operating speed and the brake meean effective pressure. The operating speed was limited by the limitations of propeller strength, and much effort was therefore directed toward increasing the b.m.e.p., which meant, essentially, increasing the compression ratio. It is from that period that the still-continuing researches looking toward possible increases in the highest useful compression ratio by the use of improved combustion chamber forms and improved fuels date. Up to the time of the war it had been generally considered that as long as gasoline was used as fuel there was little chance for increasing the compression ratio materially, but for aircraft work the value of even a slight gain in output without increase in weight was so great that researches along this line were considered well worth while.

Another development which the automobile engine owes to research carried out primarily in connection with aircraft-engine problems was the introduction of improved materials, the most important of these being improved valve steels. About 1921 the high-tungsten steels, generally referred to as high-speed tool steels,

(*Turn to page 448, please*)

Calculating Front Axle Stresses by Practical Method Supplies Data Quickly

by K. W. Najder

CALCULATION of stresses in machinery parts is incomplete unless the engineer knows from experience what factors of safety are necessary. Selection of the proper material also is important, as are the hardnesses of the material and the minimum elastic limit, on which latter all factors of safety should be based. The time factor is of prime importance, in all calculations, because usually the engineer is required to supply the information rapidly, and he must be able also to quickly revise his calculations for certain changes which may be found desirable during the progress of the design work. Very often practical and empirical methods of calculation are more important than too theoretical ones. It does not matter in what way we arrive at certain data, as long as the data serve well in establishing necessary designs. The writer therefore will present the calculations from the practical side, giving also factors of safety, suitable materials and their hardnesses.

As an example, the writer presents an axle that was used for a number of years and proved to be entirely satisfactory. The axle was figured in the following manner:

Road weight of four-door sedan	3,500 lb.
Five passengers @ 150 lb.	750 lb.
Total weight	4,250 lb.

Estimated effective front tire radius—14¼ in.

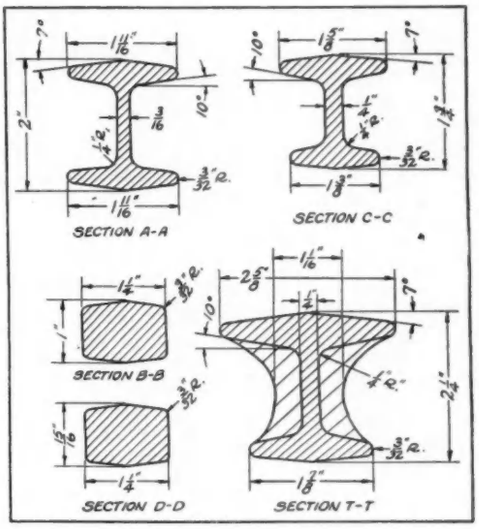


Fig. 1-A—Various cross sections of axle

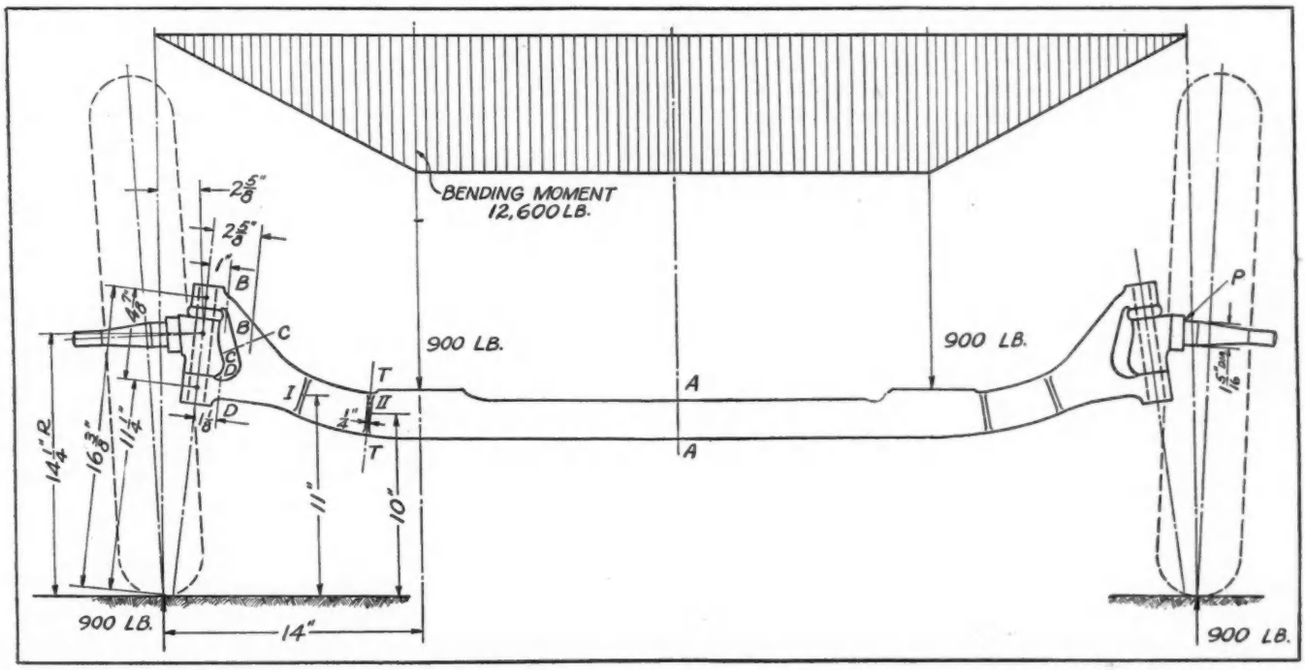


Fig. 1—Drawing of front axle and diagram of bending stresses in it

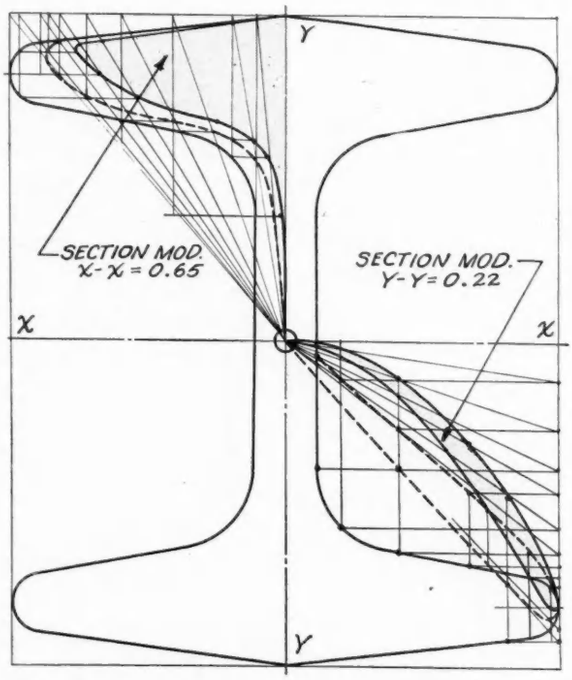


Fig. 2—Determination of section moduli of section A-A + + + + + + +

A passenger car front axle carries usually about 42 per cent of the total load, so that 21 per cent of the total is carried by each wheel. In our case,

$$4{,}250 \times 0.21 = 892 \text{ lb.}$$

or, say, 900 lb. on each wheel.

Fig. 1 represents the vertical bending moment, which increases from zero in the center plane of the wheel to the maximum at the center of the spring pad, and remains at the maximum between spring pads. The bending moment at the spring pad and between spring pads (section A-A) is

$$900 \times 14 = 12{,}600 \text{ lb.-in.}$$

Fig. 2 represents section moduli of section A-A. The upper shaded area represents the section modulus in respect to axis X-X, and the lower shaded area represents the section modulus in respect to axis Y-Y. The stress at section A-A is

$$12{,}600/0.65 = 19{,}384 \text{ lb. p. sq. in.}$$

The material of the I-beam is S.A.E. No. 1045 steel, having a Brinell hardness of 228 to 269. The minimum elastic limit of this material at 228 Brinell is about 70,000 lb. p. sq. in. Accordingly, the factor of safety is

$$70{,}000/19{,}384 = 3.6.$$

The writer has found, from experience, that the minimum section modulus with respect to axis Y-Y should be not less than one-third of the section modulus with respect to axis X-X. In our case, it should be

$$0.65/3 = 0.216$$

and Fig. 2 shows it to be 0.22.

The wheel is not perpendicular to the ground, but inclined at a slight angle; also, the steering knuckle spindle is not entirely horizontal, but inasmuch as the angles of inclination are very small, we shall not consider them in our calculations. The errors thus introduced will be negligible and the calculations will be less complicated.

The reaction of 900 lb. at the wheel contact with the ground creates a bending moment at section B-B of

$$900 \times 1 = 900 \text{ lb.-in.}$$

The section modulus is roughly

$$1^2 \times 1.25/6 = 0.2$$

and the stress is

$$900/0.2 = 4{,}500 \text{ lb. p. sq. in.}$$

The factor of safety, therefore, is

$$70{,}000/4{,}500 = 15.5.$$

This would seem to be a very high factor of safety in comparison with the factor of safety at section A-A, but it would not be advisable to lower this factor, on account of the proximity of the knuckle-pin bearing. This arm should not deflect unduly, in order to keep the bearings in line and thereby assure long life for them. At section C-C the bending moment is

$$900 \times 2.625 = 2{,}360 \text{ lb.-in.}$$

Fig. 3 represents section moduli of section C-C. The left-hand shaded area represents the section modulus in respect to axis X-X, and the right-hand shaded area represents the section modulus in respect to axis Y-Y. The stress at section C-C is

$$2{,}360/0.42 = 5{,}600 \text{ lb. p. sq. in.}$$

and accordingly the factor of safety is

$$70{,}000/5{,}600 = 12.5.$$

The foregoing figures are all based on the static load. Section D-D will be subjected to maximum stress when the brakes are applied and the wheel becomes locked and slides. In this case the tractive force is the weight times the coefficient of friction of rubber against the ground, and is

$$900 \times 0.6 = 540 \text{ lb.}$$

This force acts perpendicularly to the plane of the paper. The load on the lower knuckle-pin bearing is

$$540 \times 16.375/4.875 = 1{,}810 \text{ lb.}$$

The bending moment at section D-D is

$$1{,}810 \times 1.125 = 2{,}040 \text{ lb.-in.}$$

The section modulus in respect to axis Y-Y is roughly

$$1.25 \times 0.9375/6 = 0.244$$

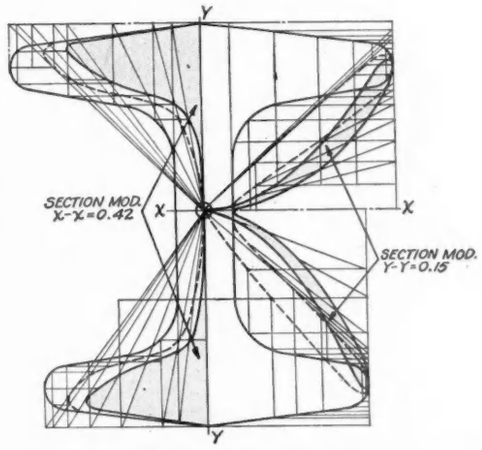


Fig. 3—Determination of section moduli of section C-C + + +

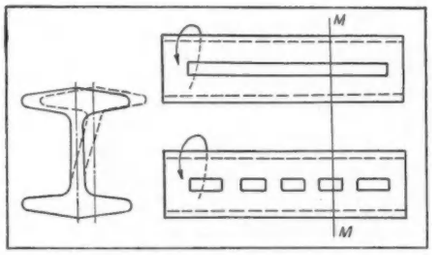


Fig. 4—Effect of longitudinal slots in pipe on its torsional stiffness + +

and the stress is

$$2{,}040/0.244 = 8{,}340 \text{ lb. p. sq. in.}$$

The factor of safety is

$$70{,}000/8{,}340 = 8.4$$

which factor is sufficient, considering that an extreme load was assumed, with the wheel sliding, which very seldom happens.

The same method of figuring can be applied to the determination of any section of the I-beam.

As previously stated, the maximum tractive effort at the contact point of the tire with the ground, with wheels locked and sliding, is 540 lb. per wheel. This force of 540 lb. produces a torsional moment in the outer portion of the I-beam, between the axle end and the spring pad. No torsion occurs between spring pads. This torsional moment is

$$540 \times 11 = 5{,}940 \text{ lb.-in.}$$

at rib I, while at rib II it is

$$540 \times 10 = 5{,}400 \text{ lb.-in.}$$

With circular or almost circular sections, the torsional section modulus can be easily determined, and also the stress. But, when a section is not circular nor square, the unit stress no longer varies directly as the distance from the center of gravity; the cross-sections become warped, parts of the section shift sideways, and the analysis becomes very complex and difficult to make. With I-sections, the writer uses common sense based on long experience and some empirical formulae developed by experiment. The writer was very successful in employing ribs tying the flanges together as per section T-T, which section nicely withstood a torsional moment of 5,400 lb.-in. Ribs give support to the flanges and the section does not distort so easily when subjected to torsion and withstands torsional moments much better (see Fig. 4, A). The value of ribs will be realized if we take as an example a piece of pipe as shown at B in Fig. 4. One pipe has a continuous slot; the other has a number of slots with occasional supports. It is evident that the pipe with occasional supports will withstand more torsion, though the section M-M of both pipes is the same.

Steering Knuckle Spindle

The maximum bending moment of the spindle occurs while the car is negotiating a sharp curve at such a speed that, owing to centrifugal force, one wheel lifts off the ground and the whole weight of the front is carried by the other (outside) wheel. In this case, the ground reaction will amount to 1,800 lb. and the skidding reaction

$$S = 1{,}800 \times 0.6 = 1{,}080 \text{ lb.}$$

which force produces a bending moment on the spindle directly in front of the inner bearing at point P. The bending moment is

$$1{,}080 \times 14.25 = 15{,}390 \text{ lb.-in.}$$

The spindle diameter at this point being 1.312, the section modulus is

$$0.1 \times d^3 = 0.1 \times 1.312^3 = 0.226$$

The stress is

$$15{,}390/0.226 = 68{,}000 \text{ lb. p. sq. in.}$$

The material for the steering knuckles is S.A.E. No. 3135 steel, the Brinell hardness of which is 241 to 269. The minimum elastic limit of this material at 241 Brinell is about 110,000 lb. p. sq. in. The factor of safety therefore is

$$110{,}000/68{,}000 = 1.62.$$

This is the minimum factor of safety one should allow for this part. The diameter of the spindle at any other section can be easily determined by ascertaining the force due to the skidding reaction on the inner and the outer wheel bearing, and from the bearing load, the bending moment and the stress at any section can be easily figured.

The area of the knuckle-pin bearings is determined from the static load. Since the reaction produces a couple, the load on each bearing is calculated as follows:

$$900 \times 2.625 = P \times 4.875.$$

Therefore,

$$P = 900 \times 2.625/4.875 = 483 \text{ lb.},$$

this being the load on each bearing. The area of the upper bearing is 1.1 sq. in., that of the lower bearing, 1.35 sq. in. The specific load on the upper bearing is

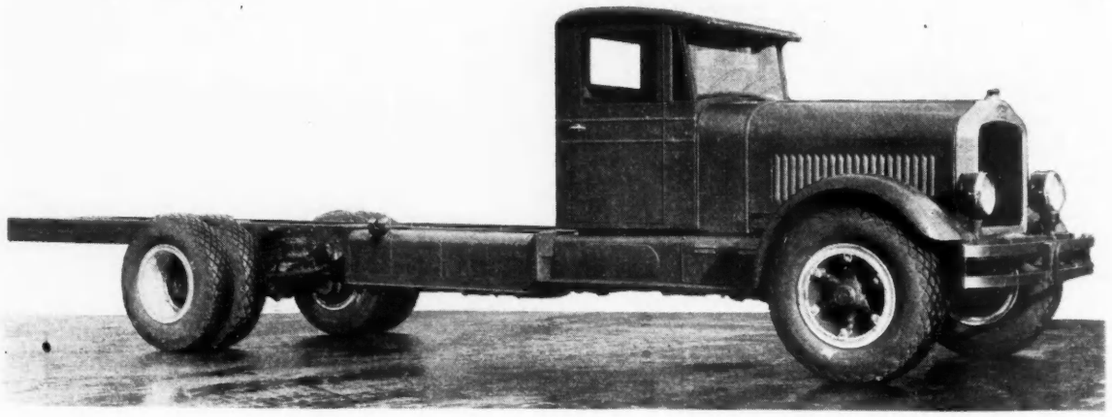
$$483/1.1 = 440 \text{ lb. p. sq. in.},$$

while that on the lower bearing is

$$483/1.35 = 358 \text{ lb. p. sq. in.}$$

These bearing pressures should not be exceeded if a reasonable length of life of the bearings is expected. The reason the specific load on the lower bearing is made smaller than that on the upper bearing may not be obvious. The fact is that loads due to tractive force and skidding reaction in reality make the load on the lower bearing greater. The tractive force acts along a line parallel to the direction of motion of the car, while the skidding reaction is perpendicular to the vertical center plane of the car. The resultant force will make an angle of about 45 deg. with the vertical center plane of the car, and wear of the bearing actually is a maximum on an axis making such an angle with the center plane.

The writer here wishes to explain the reason why the lower knuckle-pin bearing wears somewhat to one side, and also why the outer wheel bearing wears considerably without apparent reason, as it seemingly does not carry a constant load. A car that apparently travels straight ahead actually deviates continuously from its straight course. Driving a car over a smooth and level surface covered with snow, one can see the imprint of the wheels and observe that the path consists of a succession of arcs, which can be measured on the snow. Their radii can be figured, and the centrifugal forces corresponding to them can be determined. This proves that even while driving straight ahead, there are constant side thrusts which are taken up by the outer wheel bearing and the knuckle-pin lower bearing.



New White chassis No. 641

Three New Series of Six-Cylinder

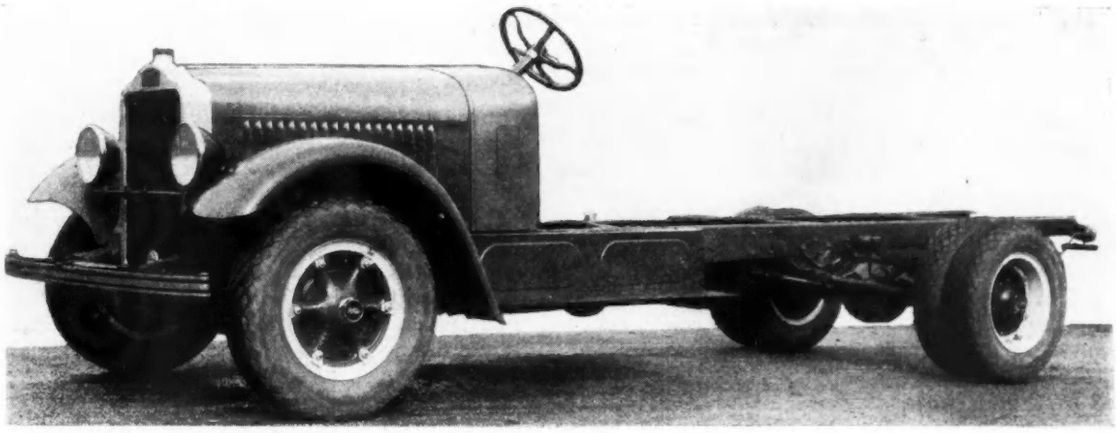
Eight chassis models have capacity range of 15,000 to 32,000 lb. with auxiliary transmission optional on six models

THREE new series of six-cylinder truck models, providing a capacity range of from 15,000 to 32,000 lb. gross weight rating and meeting the varied hauling requirements in dump, freight and oil field operation, are announced by the White Co. Eight chassis are included in the three series and are grouped as follows: 620 Series, two models from 15,000 to 18,000 lb.; 630 Series, two models from 20,000 to 24,000 lb.; and 640 Series, four models from 20,000 to 32,000 lb.

All three series are characterized by unit mounted six-cylinder engines having seven bearing crankshafts; four wheelbase options, longest at extra cost; four-wheel brakes; standard and oversize balloon and high-pressure tires; cam and lever steering gears; electrical or mechanical fuel pumps; 35 to 50-gal. gasoline tanks; heat-treated reinforced pressed steel frames; full-floating type rear axles, and drive through radius rods. Power take-offs for auxiliary drives also can be furnished and six-wheel installations are available in the larger models, increasing gross weight ratings up to 40,000 lb.

Specifications 640 Series

	640	641	642	643
Capacity	20,000 to 32,000 lb.			
Wheelbase	157-180-195-214 in.			
Tires	9.00/20	9.75/20	9.75/24	10.50/24
Gasoline tank	35 gal.	35 gal.	50 gal.	50 gal.
feed	Autopulse			
Rear axle, drive	bevel		double reduction	
ratios	4.75 to 5.70	5.85 to 10.15	6.82 to 13.15	6.82 to 13.15
Frame	8⅛ x 3 1/16	5/16	section varies with wheelbase	
Service brakes	4-wheel		driveshaft	
hand	internal		driveshaft	
Springs, front	42 x 3—9	42 x 3—11	42 x 3—12	42 x 3—12
rear	56 x 3½—12	56 x 3½—16	52 x 5—14	52 x 5—14
auxiliary	5-leaf	4-leaf	none	none



Standard chassis model No. 620

Truck Models Swell White Line

The engines are overhead valve-type Whites with synchronized two-spark ignition, aluminum double strut pistons, seven-bearing crankshafts; pressure lubrication, oil filtering system integral with the oil pan, direct-babbitted connecting rods and salt-cooled exhaust valves. The same engine, the 4 x 5¼-in. Model 3A, displacing 396 cu. in. and developing more than 75 hp., is used in the 620 and 630 Series. The heavy-duty series is powered by 4⅜ x 5¾-in. Model 1AB, which displaces 519 cu. in. and develops more than 100 hp.

Single plate clutches with automatic lubrication are furnished in the two smaller series, while two-plate type clutches with special spring-loaded engagement and lubrication to ball-bearing clutch throughout are employed in the 640 Series. Four-speed transmissions are provided in all three series but an auxiliary transmission can be fitted behind the main transmission at extra cost in the 630 and 640 Series. The rear axles of the series vary both in capacity and drive. These differences are revealed in the accompanying box.

Radiator shells on all models are of attractive design, being of polished cast aluminum with removable core, flexibly mounted on the frame. Cooling is thermostatically controlled.

Although the four-wheel brakes of the entire series are of the two-shoe internal type, those in the 620 and 630 Series are applied hydraulically through vacuum boosters, while air is employed in the 640 Series. Hand brakes in all three series are of the driveshaft mounted double drum internal type.

Gasoline tanks are mounted on cradles on the right side with three-point suspension and have capacities of from 35 to 50-gal. All springs are semi-elliptic and in some models are furnished with helpers.

Standard equipment includes: front bumper, speedometers, oil pressure gage. Controls for light and throttle are fitted in the center of the steering wheel. Cabs can be furnished on all chassis at additional cost.

Specifications 630 Series

	630	631
Capacity	20,000 to 24,000 lb.	
Wheelbases	157-168-188-215 in.	
Tires	9.00/20	9.75/20
Gasoline tank	35 gal.	50 gal.
feed	Mechanical pump	
Rear axle, drive	bevel	dble. red
ratios	4.75 to 7.14	8.70 to 10.15
Frame	8 x 3 x ¼	
Service brakes	4-wheel hydraulic	
amplified by	vacuum booster	
hand	internal driveshaft	
Springs, front	42 x 3—9	42 x 3—11
rear	56 x 3½—12	56 x 3½—16
auxiliary	5-leaf	4-leaf

Specifications 620 Series

	620	621
Capacity	15,000 to 18,000 lb.	
Wheelbases	145-157-174-195 in.	
Tires	8.25/20	9.00/20
Gasoline tank	35 gal.	50 gal.
feed	mechanical pump	
Rear axle, drive	bevel	
ratios	4.75 to 7.14	
Frame	7 15/16 x 2 15/16 x 7/32	
Service brakes	4-wheel hydraulic	
amplified by	vacuum booster	
hand	internal driveshaft	
Springs, front	41 x 2½—10	41 x 2½—11
rear	54 x 3—14	54 x 3½—16
auxiliary	none	none

Specific Output of Engines During 30 Years Increases

(*Continued from page 442*)

came into use for exhaust valves and to some extent also for inlet valves, but recently they have been replaced more and more by silicon-chromium steel. Aircraft engine experience by automobile engine builders had still another effect, and that is that it led manufacturers of high-grade engines to finish their crankshafts all over, for better balance and to permit of an increase in bearing surfaces.

The introduction of the copper-asbestos gasket about 1908 ushered in a new period in the design of light engines, for whereas just previously practically all of these had been built with integral cylinder heads, this development was quickly followed by a return to the separate head. As the separate head eliminates the need for valve caps or valve plugs, which always formed hot spots, this change permitted of a certain increase in the compression ratio. Changes in the character of the fuel marketed were rather contrary in their effects on the highest useful compression ratio. The first change was to include more and more of the heavier fractions of petroleum, and this tended to lower the highest useful compression ratio, because these fractions of lower volatility are less knock-resistant. Later came the introduction of the cracking process, and the use of cracked fuels made possible an increase in compression ratios. Another development that has made higher compression ratios possible for automobile engines is that with the increase in cylinder numbers the displacement of the individual cylinder has been reduced. With the elimination of valve caps, the use of aluminum pistons, smaller spark plugs, smaller cylinders, and improved fuels we have been able to increase the compression ratio of passenger-car engines, which was about 4 to 1 in the earliest engines, to an average of 5.23 in 1931.

Change in Fuels

There was a very rapid change in the character of automobile fuels during the period between 1915 and 1920, the end point being raised greatly, to about 475 deg. Fahr. in 1920. The gasoline of the early automobile period probably had an end point of about 300 deg., and with this fuel no heat was applied to either the air, the fuel or the mixture. About 1910 it became common to use an air stove on the exhaust pipe through which the air for the carburetor was drawn. Later it was found that this was not the best way to apply the heat, as the air was heated more than the fuel, and thus the volumetric efficiency and the maximum engine power were seriously decreased. For that reason about 1915 the so-called hot-spot was introduced, which consisted of a small area of common wall between the inlet and exhaust manifold, so located that unvaporized fuel coming up through the inlet riser would be thrown against it. Still later, when the end point rose beyond 450 deg. Fahr., this was no longer sufficient to assure thorough vaporization and consequent uniform distribution of the fuel, and regular exhaust jackets on the inlet manifold were provided. This again had a serious effect on the volumetric efficiency, and about 1924 heat control was introduced, which enabled the driver to apply more or less of the exhaust heat to the intake manifold according to the atmospheric temperature.

The change in volatility of fuel, which came so suddenly between 1915 and 1920, brought with it a great deal of trouble from crankcase dilution. The first solution of the problem arising therefrom was the oil distillator, and this was used to some extent for a number of years, but it was rather troublesome. Its effectiveness was dependent upon its being maintained within a rather narrow temperature range, for when it became too cold it would not distill off the kerosene-like fractions, and when it became too hot it would crack the petroleum products and become choked with petroleum coke. About 1923 the practice of crankcase ventilation was introduced and has found many adherents since. It eliminates moisture from the crankcase, thus preventing crankcase corrosion, and it also removes at least the more volatile fuel elements in the crankcase oil.

Many other refinements have been introduced in connection with gasoline engines in the course of the past decade. All of the fluids that come in contact with the wearing surfaces—fuel, oil and air—are now filtered or otherwise cleaned. The cooling water is now maintained at a substantially constant outlet temperature by a thermostat, or shutters in front of the radiator are opened and closed to maintain a substantially constant temperature under the hood. The temperature of the water leaving the cylinder jacket is being constantly indicated to the driver, who is thus apprised early of any abnormalities developing in the operating condition.

In the passenger car industry cylinder number and cylinder arrangement always have been important topics of discussion and speculation, and one of the past presidents of our society, W. H. Van Dervoort, in his inaugural address in 1915, said that it was still undecided at that time whether the ultimate car engine would be a four or a twenty-four. Reference has been made already to the Packard twelve, which appeared in 1915. This was followed shortly after by a number of other 12-cylinder cars, but all disappeared from the market again within a few years, and it seemed then that the practical limit in cylinder numbers had been reached and even passed; but a new forward movement in this direction was inaugurated in 1930 when the Cadillac company, which had started in with a single cylinder and moved forward in steps equal to twice those that usually marked progress in cylinder multiplication, came out with a sixteen. Automobile history is quite young as yet and we may still see Mr. Van Dervoort's vision of a 24-cylinder car realized.

The most remarkable development in connection with automobile-type engines has been the great increease in their operating speed. Normally an increase in speed is accompanied by an increease in noise and in vibration, but it hardly needs emphasis that today's engines are far smoother running and more silent than those of 30 years ago.

Piston Speed 600 ft.p.m. in 1895

As regards piston speeds, the starting point, in 1895, was about 600 ft. p. m. In 1905, when the A.L.A.M. horsepower rating was adopted, which was regarded as representative of the performance of automobile engines of that period, the piston speed was set down as 1000 ft. p. m. and the brake mean effective pressure as 67 lb. p. sq. in. An extensive compilation of horse-

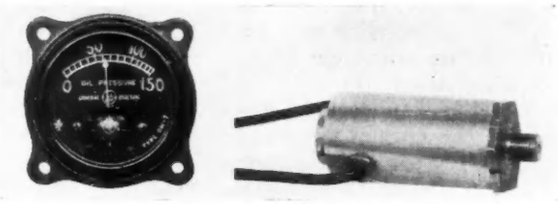
power data published in 1915 showed that the average engine speed corresponding to the peak of the horsepower curve was then 1600 ft. p. m. and the average brake mean effective pressure about 72 lb. p. sq. in. At the present time passenger car engines of the multiple-cylinder type operate at about 2500 ft. p. m. piston speed, and the brake mean effective pressure at maximum power varies from 80 to 85 lb. p. sq. in. The piston speed having increased from 600 to 2500 ft. p. m. and the b.m.e.p. from about 65 to 85 lb. p. sq. in., the horsepower from an engine of given displacement has been increased in the proportion of (85/65 × 2500/600) = 5.35 times. The weight per horsepower has been decreased from about 50 to about 10 lb.

Along with the increase in specific output should be mentioned the increase in reliability. The early high-speed gasoline engines were exceedingly fickle. A story characteristic of the unreliability of these engines is being told of Levassor, one of the engineering pioneers of the industry.

In the early development of the Panhard car he set himself the task of covering a certain distance in the neighborhood of the factory, about one mile in length, without involuntary stop, and he tried and tried until he finally succeeded. In my recent experience a passenger car completed 50,000 miles without any engine trouble worth mentioning, except some from rusting of the water-pump shaft, and I am told that in bus operation at least 100,000 miles is expected without an engine overhaul.

G. E. Indicating Instruments for Aircraft Actuated by Temperature-Sensitive Coils

THE General Electric Co. announces a line of indicating instruments and operating elements for aircraft, including oil-temperature indicators, cooling-liquid temperature indicators, oil pressure indicators, fuel pressure indicators and air-temperature indicators.

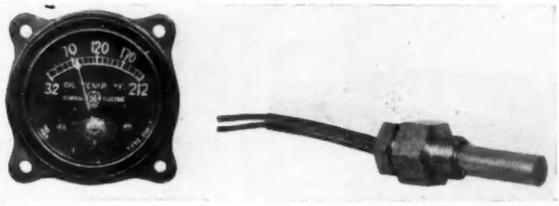


Oil pressure gage for aircraft

The new instruments are built in cases which conform to standard Army-Navy specifications. The temperature and pressure elements are separate units; those for oil temperature, oil pressure, fuel pressure and cooling liquid temperature are designed to be attached to the standard fittings, replacing the conventional temperature bulbs and pressure tubing. The elements for the air temperature indicators are arranged for mounting on any convenient part of the aircraft. These air-temperature indicators are used for ice-warning and wherever similar temperature indicators are desired.

All the indicators operate on the principle of current flow in a resistance bridge circuit. The current in a variable resistance is compared with that in a fixed resistance, the latter being part of the indicating instrument and the variable resistance being in the separate element. The resistance of the temperature element changes with pressure. Only a small amount of current is required (approximately 50 milli-amperes normally), the supply being a 12-volt battery. The accuracy of the instruments is said to be independent of variations in battery voltage.

All the instruments are furnished with shock-absorbing cases which conform to Army-Navy specifications and permit flush mounting on instrument panels. The inside cases and operating mechanism float in sponge rubber carried by the outer cases. The outer cases protect the operating mechanisms from mechanical injury and act as magnetic shields to reduce interference with card compasses which may be located nearby.



Oil temperature gage of the General Electric

The temperature elements are resistances sensitive to temperature. Their electrical resistance changes in accordance with the temperature to which they are subjected. For oil temperature and cooling liquid temperature the elements consist of hermetically sealed metal cartridges threaded at one end for attaching to the standard fittings on engines or radiators. Inside the cartridges are the temperature-sensitive resistance coils, and connections are brought out for wiring to the indicating instruments. For ice-warning and air-temperature the elements are designed for maximum sensitivity with minimum drag. They are intended for mounting on struts, wings or fuselage members.

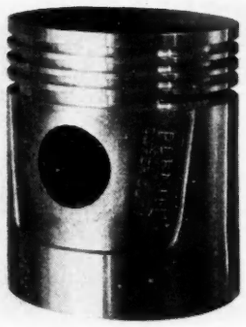
The pressure elements consist of variable resistances actuated by a copper bellows, totally enclosed in weatherproof, oiltight, metallic cartridges. They are threaded for attaching to the standard engine and fuel-line fittings.

The oil (if oil pressure) or the fuel (if fuel pressure) enters the open end of each bellows, causing it to expand in proportion to the pressure. This expansion changes the electrical resistance of the coil. Connections are brought out for wiring to the indicating instruments.

NEW DEVELOPMENTS—AUTOMOTIVE

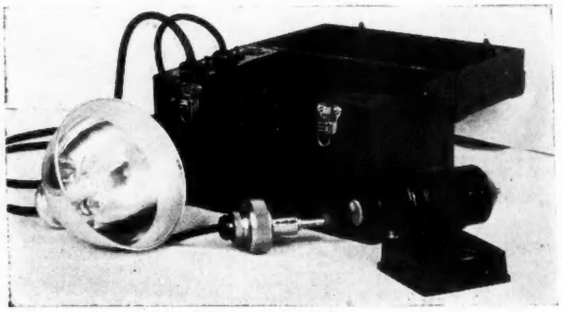
Permite Super-Duty Piston

A NEW aluminum alloy piston termed the Permite Super-Duty has been announced by Aluminum Industries, Inc., of Cincinnati, Ohio. It is a full-trunk-type piston and is said to be the nearest approach to the solid-skirt type yet produced by this company. There is a break in the path of heat flow between head and skirt only on the minor thrust side, by a slot in the last ring groove. This slot also serves as a ventilator for an oil ring, that is, as a passage through which oil scraped off the cylinder wall by the oil ring may return to the crank chamber. Clearances determined after tests are said to result in freedom from piston slap, lack of excessive friction throughout the normal temperature range, and a practically 100 per cent bearing surface. The vertical slot in the skirt connects with the circumferential slot in the last ring groove; this longitudinal slot serves to control expansion and contraction and acts as a safety feature when the engine reaches an abnormal temperature, as, for instance, through the breaking of a fan belt.



New Model of Vibroscope

AN improved model of the Vibroscope, a device for studying the behavior of rapidly moving machine parts, has been placed on the market by the Electron Corp., 6 Varick St., New York. This new Model 3 differs from the Model 1 which it replaces in that the illuminating power is about five times as great. The motor unit, referred to further on, is a new feature which was not available with the older model.



The Vibroscope is applicable to the study of rotary, reciprocating, or any type of cyclic motion, at any speed. The moving parts can be made to appear stationary at any desired position in the cycle of operations, by illumination with a powerful neon lamp, which flashes in sychronism with the motion.

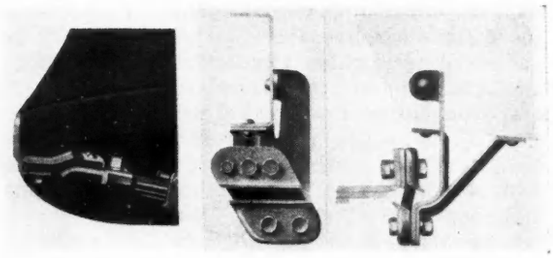
The flashing lamp is controlled either by a breaker head which is driven directly from the mechanism under observation, or by a governed motor unit quite independent of it. By slowly turning a phase-adjusting knob on the breaker head, or by throwing the motor unit slightly out of synchronism with the moving parts, the movements can be observed at greatly reduced speed, as in a slow motion picture. Any abnormal condition or fault in the operation of the moving parts can be seen at once.

The instrument comes in a wooden carrying case covered with leatheroid, and complete with battery it weighs 24 lb.

New Belflex Spring Mountings

TWO new types of spring mountings have been developed by the Belflex Corp., Toledo, Ohio. Spring mountings of the rubberized fabric type have been manufactured by the Belflex Corp. for the past 10 years, but the earlier designs involved some undesirable features, which have been overcome in the latest product.

One of the new types is known as the pivot mounting, and can be used at either end of the front spring and at the forward end of the rear spring. The mounting consists of three major parts, a frame bracket with an inclined surface, a curved spring plate, and a rubberized fabric link, which latter is clamped to the frame bracket and the spring plate with its opposite ends. The stresses on the fabric link range from a direct compression when the car is being briskly accelerated, to a direct tension when the brakes are suddenly applied. The spring plate used with this flexible pivot mounting is a stamping secured to the master leaf of the spring by a single bolt, its sides being flanged to fit over the master spring.



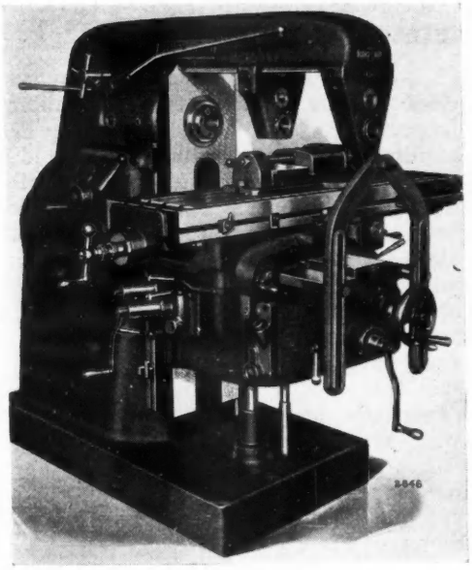
To the opposite end of the spring from that at which the pivot mounting is used an inclined shackle can be applied, as illustrated herewith. This consists of a fabric link securely clamped at one of its ends to the spring end, and at its other end to the frame bracket. To eliminate the tendency to side sway, corresponding links on opposite sides of the car are inclined toward

PARTS, ACCESSORIES AND PRODUCTION TOOLS

each other. Being inclined, the fabric link acts partly in tension and partly in shear for both vertical and transverse forces.

No. 2 Cincinnati Millers

ANOTHER new Cincinnati Knee & Column type milling machine—known as the new No. 2 Cincinnati Miller, is now being offered in the Plain, Universal and Vertical styles by The



Cincinnati Milling Machine Co., Cincinnati, Ohio. Sixteen spindle speeds, ranging from 20 to 500 r.p.m., and sixteen table feeds ranging from 1 in. to 20 in. (low and high series also offered) are changed by an automatic power shift mechanism controlled from either the front or rear of machine. To change speeds at the front you merely shift the lever located at the left of the saddle (from rear-shift the lever at the back side of the projected area carrying the speed and feed dials) to the left with starting lever in stopped position, until the desired speed on the upper revolving colored dial appears opposite the arrow. The new speed rate then is obtained by engaging the starting lever. Changing feeds requires only the shifting of the same lever, used for selecting speed, in the opposite direction, until the desired feed on the lower revolving dial appears opposite the arrow.

Complete control from the front or rear of all power and hand feeds, including power quick traverse, is another feature for the first time found on this size of milling machine.

Recommended motor drive is 5 hp., 1750 r. p.m. for all models. Net weight for motor driven machines is 5950, 6300, and 6450 lb., for the plain, universal, and vertical types respectively. Floor space is 98 x 94, 98 x 94, and 98 x 76 in. respectively. The table working surface is 49 x 12 in. on all types.

National Maxipres for Coining

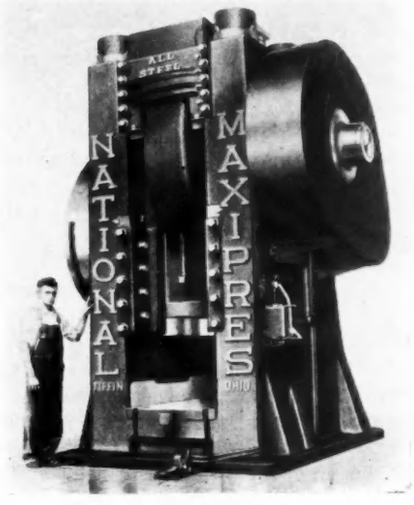
THE National Machinery Co., Tiffin, Ohio, is placing on the market the Maxipres for the coining, swaging or forming of parts, either hot, semi-hot or cold, at high speeds.

It is made in eight sizes: No. 1, No. 1½, No. 2, No. 3, No. 4, No. 5, No. 6, No. 7½, and varying in weight from 19,000 to 368,000 lb. The various size ranges are adapted for semi-hot coining any part that can be produced in a National high-duty forging machine of corresponding size rating.

As may be seen from the illustration, the entire frame, including base, crown and columns, is a one-piece steel casting. All cross-members are cast integral, forming a box section to insure rigidity. The distance between the die seat and main shaft has been materially shortened.

The pitman is of the one-piece non-adjustable type. There are no threaded adjustments on the pitman, since all adjustments of the Maxipres for die height are located on the bed frame proper. All pitman bearings are plain full diameter bearings.

Among the features that have been taken from the National high-duty forging machine is the National patented over-arm slide. This slide extends over and above the eccentric shaft, forming an extended pilot bearing, giving increased area and support. This design makes possible a great reduction in the distance from the die bed to the shaft, between which the strains occur.

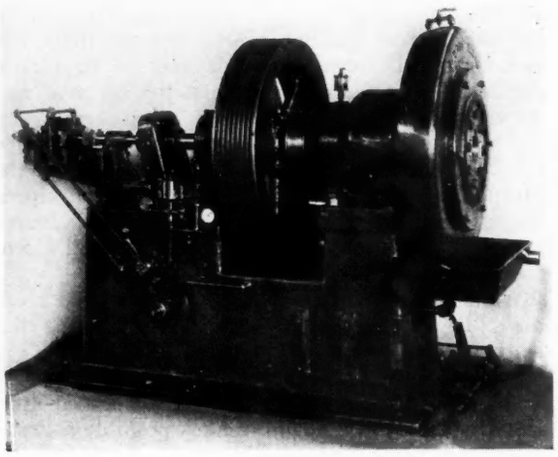


The Maxipres is equipped with the National quadruple abutment clutch, which starts the press in a quarter revolution, and the air trip. The speed of the quadruple clutch increases production; it also prolongs die life when operating on hot work by reducing the time the hot metal is in contact with the dies. The air starting trip is extremely sensitive, requiring only the slightest pressure to operate. The advantage of this device is that it sets the clutch parts in operation much faster than is possible with any manually operated starting device.

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Semi-Automatic Opening Die Swaging Machine

A MACHINE for automatically compressing the pocket end of copper terminals onto the ends of insulated flexible wire cables, by the rotary swaging process, has recently been



developed by the Langelier Mfg. Co., Providence, R. I.

In this method the tubular or pocket end of the terminal over the end of the cable, then places pressed into a solid mass.

Two types of terminals can be swaged onto the cable, one being a plain cylindrical copper tube, the blade end of the terminal being formed after the swaging operation is completed. In the other type, the blade of the terminal is completely formed before being swaged onto the cable.

The operation of swaging the terminal onto the cable end is accomplished in the following manner: The operator slips the pocket end of the terminal over the end of the cable, places the terminal between the dies which are in an open position, and locates it by inserting the blade end of the terminal into a slotted stationary mandrel located at the rear of the dies. He then trips a foot pedal which starts the machine through its swaging cycle. After swaging one terminal, the operator removes the terminal from the machine and then goes through the same procedure to swage the other end. The machine can be set to stop after the completion of each cycle or to run continuously. A locating mandrel prevents the terminal from turning or being twisted while being swaged. If the tubular type terminal is to be swaged, a spring collet that is opened and closed by compressed air is used. Collets for the tubular type of terminals and the slotted adapters for the blade type are interchangeable in the locating mandrel.

Two speeds are provided, one to give an output of nine per minute for the small terminals, and one of six per minute for the large terminals.

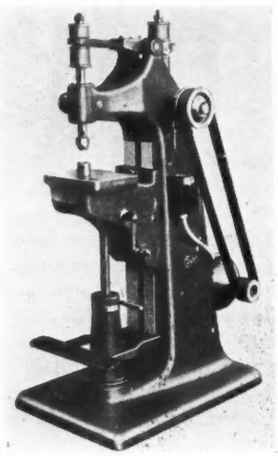
The flywheel is grooved for 8 Gilmer Vee ropes and is driven by a 15 hp., 1200 r.p.m. motor mounted on a knee bracket which is bolted to the base. An adjustable motor base is provided for adjusting the Vee ropes to their proper driving tension.

The machine covers a floor space of 5 ft. by 8 ft., has an overall height of 5 ft. and weighs approximately 8000 lb.

Grant Model No. 5A Riveting Hammer

THE No. 5A riveting hammer which has been added by the Grant Mfg. & Machine Co., Bridgeport, Conn., is designed to meet the demand of the automotive industry for heading cold rivets up to 5/8 in. diameter. This type of riveting machine is known as a vibratory hammer—the hammer spindle is caused to vibrate in a vertical direction between 1200 and 1500 blows per min. Heavier jobs require the higher speed.

The operation of raising and lowering the table is done by turning the crank handle on the side, this in turn causes the jack screw, through a pair of miter gears, to turn in the stationary nut located at the top of the cylindrical support at lower end of screw.



The clutch is adjusted at rear of machine by turning of the mainshaft bushing in its bearing by a pin spanner wrench while treadle is held down at its lowest position. A brake is also provided to stop the hammer spindle in its uppermost position to allow the work to be inserted and removed easily. This brake is of the lever type and is located directly beneath the main pulley and hinged by a stud at its outer end at rear of machine.

The treadle is designed to be reached by operator's foot from any position and at the same time to require only a light pressure of the foot.

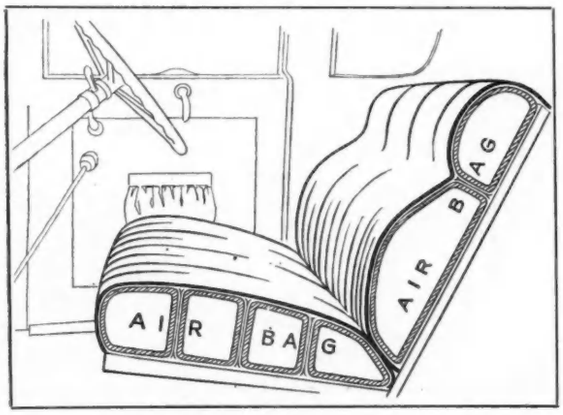
The machine requires a 3 hp. motor, 1750 r.p.m.

Airian Pneumatic Cushions

PNEUMATIC cushions for automobile seats were exhibited at the New York show by the Airian Products Corp. of New York, for whom they are being manufactured by the Seiberling Rubber Co. of Akron, Ohio. The air bags are made of inner tube stock of 0.060 in. gage. Two

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

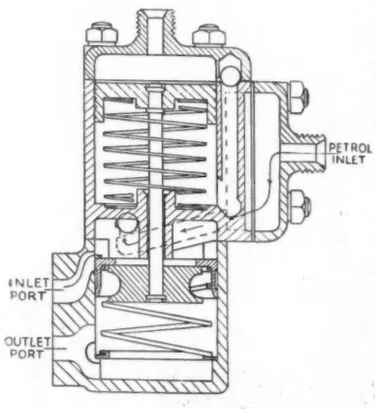
bags are used in each seat and each back, and these bags are provided with tubular stays, which latter make it possible to obtain almost any form of cushion desired. These bags are pumped up to an air pressure of only slightly more than 1 lb. p. sq. in., and the lightness of the inflation pressure is said to reduce air leakage to a minimum and to result in long life of the cushions. In some cases bags are said to have stood up for a



period of over two years without attention. The proper pressure can always be restored by a few strokes of an air pump, and in case of punctures repairs can be made in the same way as with inner tubes.

S. U. "Hydraulic" Fuel Pump

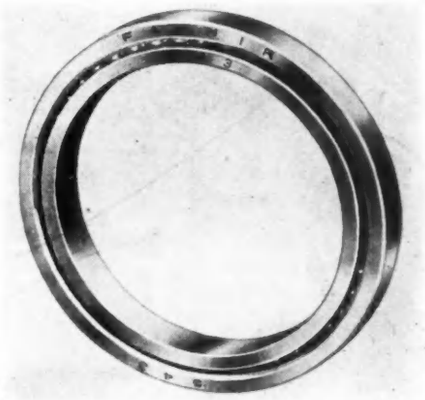
A NEW type of fuel pump operated by the pressure in the lubricating system has been developed in England by R. Leslie Kent, and is now in production by the S.U. Co., a subsidiary of Morris Industries, Ltd., at Adderley Park, Birmingham. A sectional view of the pump is shown herewith. There are two concentric cylinders, the upper the fuel cylinder and the lower the oil cylinder (or the upper the pumping cylinder and the lower the power cylinder). The two pistons are connected to the same piston rod and each piston is urged upward by a coiled spring, the spring under the fuel piston being considerably stronger than the other one. The power piston is surrounded by a flanged sleeve which serves as a valve.



Supposing the moving parts to be in the position shown in the drawing, oil will enter the lower cylinder through the inlet port and force this piston with the valve surrounding it downward, oil from the lower end of the cylinder escaping at the same time through the outlet port. The fuel piston, of course, moves down at the same time, with the result that fuel is transferred from the lower to the upper end of the fuel cylinder through a check valve at the side. As the power piston nears the lower end of its stroke, the valve ends up against an offset in the bore, and, owing to the continued motion of the piston, opens. The pressures on opposite sides of the valve now being equalized, the valve is now returned to its highest position by its spring. There being no further oil pressure on the power piston, the two pistons are moved up by the spring under the pump piston, and fuel is delivered to the carburetor. At the same time an additional charge of fuel is drawn into the lower part of the pumping cylinder.

Fafnir Ball Bearings for Aircraft Torque Tubes

A SERIES of ball bearings having an outside diameter only slightly larger than the bore, and of narrow width, for which there is a need in the artcraft industry, has been developed and placed on the market by the Fafnir Bearing Co. of New Britain, Conn. This bearing is designed to make possible comparatively frictionless operation under conditions of moderate loads and low speeds, as on torque tubes. Space limitations prevent the use of an integral seal, but the housing can be designed to retain the lubricant and provide protection against dirt.



Since the tolerances on seamless aircraft tubing are rather large, the bearings, which have bores 1/16 in. larger than the nominal tube diameters, should be mounted on sleeves, and these sleeves can be made with a shoulder against which the bearing abuts.

This special full-type ball bearing without retainer, known as the 540 Series, is made in six sizes, the bores ranging from 1/16 to 2 5/16 in. in ¼-in. steps.

Automotive Oddities—By Pete Keenan

FIRST AUTO TO CLIMB PIKES PEAK WAS LOCOMOBILE IN 1901.
This was claimed as the highest point ever reached by an automobile at that time. The car was driven over the old carriage road by W.B.Felker and C.A.Yont. They reached the summit on their second day's climb. August 12th 1901.
Pete Keenan
LONDON "BOBBIES" FIND THIS NEW TYPE OF THREE-WHEELER SPEEDY AND HANDY IN TRAFFIC.
GK 6873
THE FLYING GRANDMA
Mrs H. Foster Bain N.Y. 51 Years, old has her Pilot's license.
ON A WISCONSIN HIGHWAY A COW HAS THE RIGHT OF WAY OVER AN AUTOMOBILE.
THIS STEAM CREATION RECENTLY DISCOVERED IN LOS ANGELES, was built in 1892 by Achille Philion, a frenchman, it had a top speed of 10 Miles an hour.

NEWS OF THE INDUSTRY

Rails Begin New Fight for Automobile Shipments by Filing Lower Tariffs

PHILADELPHIA, March 11—Freight reductions of up to about 50 per cent will become effective April 10 on motor vehicles shipped between points in Central Freight Association territory and from points in this territory to points in adjacent states of Wisconsin, Minnesota, Iowa and the Upper Peninsula of Michigan. Part of these areas are in Western Trunk Line rate territory.

Rates between other points in Western Trunk territory are being checked with a view to revision by a special committee of Western Trunk Line railroad executives. Southwestern railroads already have petitioned the I.C.C. for permission to establish greatly reduced rates on passenger automobiles from specific producing, manufacturing and assembling plants for hauls up to five hundred miles in the Southwest Kansas-Missouri territories. Details of this petition were given in *Automotive Industries* last week.

The reductions made in C.F.A. territory, and proposed in the Southwestern territory, are more far-reaching than the coming change in classification of passenger cars from one 110 per cent to 100 per cent of the first-class rate which will affect primarily the movement of traffic in and between the Eastern Trunk Line, Central Freight Association and New England rate territories as announced last week. The date on which this new classification will take effect has not yet been determined, but it seems certain at this time that it will not be until after April.

While detailed and official information is lacking regarding possible rate reduction action in rate territories other than those mentioned above, there are indications that such reductions may come about in other territories as well. The C.F.A. commodity rate reduction, definitely announced as effective April 20, unless some unforeseen opposition to approval of the rates by the I.C.C. arises, as well as the definite consideration to automobile rate adjustments known to be in process in other rate territories, was brought about chiefly through a desire on the part of the railroads to recover at least a portion of the traffic which is now being handled through truckaways and driveaways.

Approximately one-third of the new passenger car and truck sales are registered within the borders of the states affected by the new C.F.A. commodity rate schedules.

Growing desire to meet this driveaway competition resulted in railroad executives removing the matter of automobile freight rates from routing traffic department channels in many instances. Consequently it seems certain that the definite moves outlined in the opening paragraphs of this article are merely forerunners of further action in other of the seven major freight rate territories. As regards the three major rate territories not specifically mentioned in preceding paragraphs no official word is available as we go to press regarding definite rate action on automobile shipments.

That definite action on automobile rates is probable in practically every territory, however, is indicated by reports from reliable sources. So far as actual reductions going into effect on April 20 are concerned, however, only shipments within C.F.A. territory and from that territory to the limited

(Turn to page 457, please)

February Output Placed at 230,364

NEW YORK, March 11 — February production of motor vehicles in the United States and Canada was 230,364, according to report given at the directors' meeting of the National Automobile Chamber of Commerce today. This represents an increase of 29 per cent over the previous month and is the highest production for the past six months, representing the third consecutive month of advancing production.

Sales as reported from various points scattered throughout the country indicate an advancing trend in both new and used cars with stocks in good position, and prospects of continued advance during the next two months.

Directors also selected the dates for the 1932 national shows, which will be held in New York Jan. 9 to 16 and in Chicago Jan. 30 to Feb. 6, respectively.

The News Trailer

By Herbert Hosking

Studebaker announces free-wheeling on its **ambulances** and **hearses** . . . that ought to be an **inspiration** to the song writers * * * Donald D. McMillan, the city engineer of **Ventura, Calif.**, has a new use for junked automobiles . . . he dumps them into the ocean to form a **breakwater** . . . Engineer **McMillan** states that this method has been used successfully in building **revetments** along the **Missouri** River * * * the **tramways** in **Cork** (Ireland) will be replaced with **buses** * * * Leon **Duray**, speed **merchant** is building a **pair** of cars for the next **"500"** * * * "Just as a fine foreign car bears the **signature** plate of its creator, so does Marmet wear its **Marmet** endorsement" extract from a B. Altman and Co. (N.Y.) advertisement of baby **carriages** with "bodies by Marmet" * * * Prince Antoine **Bibesco**, president of the **Federation** Aeronautique Internationale, and former Rumanian **minister** to the U. S. has purchased a Ford trimotor for use in **visiting** local chapters of the **F.A.I.** in Europe * * * Henry **Ford** says he will open the **Dearborn** Inn, at his airport for the **benefit** of weary air travelers . . . late in **June** will be the **date.**

Ford Produces 85,109

DETROIT, March 10—World production of Ford cars and trucks in February was 85,109 units, the highest monthly production since last September. The February production was an increase of 29,927 cars and trucks over that in January and an increase of 40,077 over December. Schedules for March call for an even larger output.

Expansion in Ford production reflects increased sales, according to officials of the company. Sales in turn, they said, have been reflecting the reduced prices announced in January.

Chevrolet to Announce Type

DETROIT, March 12—The Chevrolet Motor Co. will make national announcement March 22 of the five-passenger coupe described in *Automotive Industries* Jan. 10 issue.

J. E. FIELDS

BYRON C. FOY

The two vice-presidents of the Chrysler Motor Corp., whose pictures are shown, have been assigned to new duties in a shift of Chrysler division heads. Mr. Fields has been active in the affairs of the parent corporation since its founding, and Mr. Foy has been one of its leading merchandisers, particularly in the New York territory

De Vaux Prices Revised

DETROIT, March 9—The following prices* have been released by De Vaux-Hall Motors Corp.

According to reports, 8000 orders are now on hand for the De Vaux 6-75. Production will commence at Grand Rapids, March 23. Distributing points already closed at Chicago, Milwaukee, St. Louis, Kansas City, Minneapolis, Newark, Utica, Salina and Grand Rapids.

In the far West distributors have been established at Los Angeles, San Diego, Bakersfield, Fresno, Stockton, Sacramento, Oakland, Salt Lake City, Portland, Spokane, Seattle and Boise. Export connections have been established at Holland, Switzerland, Belgium, Denmark, France, Honduras, Japan, the Hawaiian and Philippine Islands.

Body Type	New List Price	Former List Price
Phaeton	$595	$595
Standard coupe: (Four wood wheels—one spare rim mounted in rear)	625	595
Business coupe: (Five wire wheels—one wheel mounted in right front fender well)	645	625
Standard sedan: (Four wood wheels—one spare rim mounted in rear)	695	...
Special sedan: (Five wire wheels — one spare rim mounted in rear)	705	725
Custom coupe	795	785
Custom sedan	795	785

*All prices are f.o.b. Grand Rapids, Mich.

To Discuss Coordination

NEW YORK, March 11—The Highway Section of the International Chamber of Commerce which meets in Washington during the week of May 4 will participate in a program on Tuesday afternoon, May 5. Discussions will cover coordination of railroad and motor transport, highway transport and rail transport.

Detroit Gasket Reports

DETROIT, March 11—Detroit Gasket and Mfg. Co. reports net profit last year of $248,551, after charges and taxes, or $1.51 a share on common stock, compared with $514,109 or $3.13 a share during the previous year. Regular 30 cent quarterly dividend declared payable April 1, to stockholders of record March 20. All officers and directors were reelected.

Philadelphia Section Nominates

PHILADELPHIA, March 12—L. E. Lighton, manager of automobile manufacturers sales of the Electric Storage Battery Co., Philadelphia, described some characteristics of storage batteries at the monthly meeting of the Philadelphia Section, Society of Automotive Engineers, held here last night.

Section officers were nominated as follows: Chairman, W. Laurence LePage, chief engineer, Kellett Aircraft Corp.; vice-chairman, J. P. Stewart, research engineer, Vacuum Oil Co.; treasurer, L. C. Josephs, Jr., engineer, International Motor Co. (Allentown plant); secretary, Earl D. Sirrine, transportation engineer, the Autocar Co.

Timken Axle Reports

DETROIT, March 10 — Timken-Detroit Axle Co. has reported net profit of $842,237 for year ended Dec. 31, 1930, after depreciation and Federal taxes, equal after 7 per cent preferred dividends to 62 cents a share, par $10, on 992,096 shares of common stock, compared with net profit of $1,513,029, or $1.28 a share, in 1929.

Cash on hand, certificates of deposit, bonds, etc., amount to $3,401,404, and the ratio of current assets to current liabilities is approximately 17½ to 1.

Chrysler Shifts Fields and Foy

Each Now Heads Division of Corporation

NEW YORK, March 11—J. E. Fields, vice-president of the Chrysler Motor Corp., has replaced Walter P. Chrysler as president of the Chrysler Sales Corp., according to an announcement made by the latter.

Mr. Fields, who has been president of the De Soto Motor Corp., another Chrysler subsidiary, will be replaced in this position by Byron C. Foy, also a vice-president of the Chrysler Motor Corp., according to an announcement made to De Soto dealers by letter.

Appointment of J. L. Kenyon, director of service of the Chrysler Motor Corp., as vice-president and general manager of the Chrysler Parts Corp., with headquarters in Detroit, has also been indicated, but no official confirmation of this has been made.

The Chrysler Sales Corp. is the Chrysler Motor subsidiary which handles the manufacturing and sales of passenger cars bearing the "Chrysler" nameplate.

Mr. Fields and Mr. Foy will retain their positions as vice-presidents of the Chrysler Motor Corp.

Hoover Elects Baker

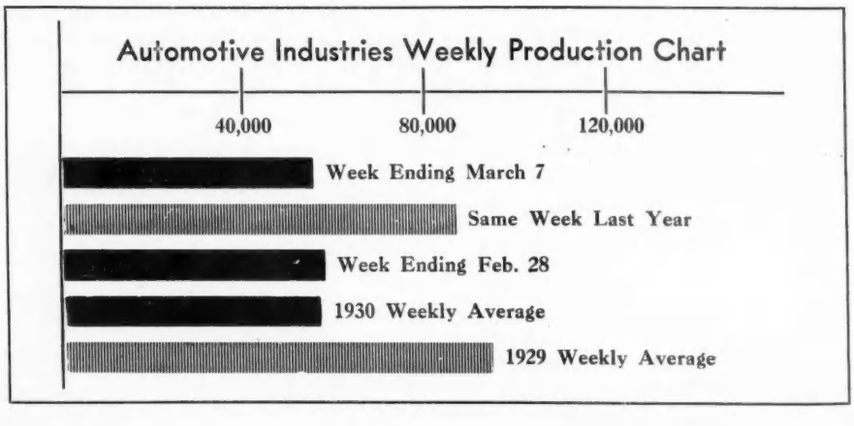
DETROIT, March 11—Earl K. Baker, of Baker Wheel and Rim Corp., has been elected a director of the Steel Ball Co., which manufactures ball-bearing tie rod ends for the Baker Company.

Smith Succeeds Kelso

DETROIT, March 11—A. R. Kelso, factory manager of the Continental Motors, Muskegon plant, has resigned. V. M. Smith, factory manager at Detroit, is now in charge of both plants.

Buhl Moving Offices

DETROIT, March 11—General and sales offices of the Buhl Aircraft Corp. are being moved to 2356 Buhl Building, Detroit.



Typical rates on assembled automobiles between points in Central Freight Association* territory, under the new C.F.A. schedule:

From Detroit or Dearborn, Mich., carload lot rates in cents per 100 lb.

To	Rates in Force Prior to April 10, 1931 (110% of Flat Class)	Rares in Force as of April 10, 6 1931	Saving in Cents	Saving in Percentage
Buffalo, N. Y.	83½	63	20½	24.5
Pittsburgh, Pa.	92	70	22	23.9
Parkersburg, W. Va.	90	75	15	16.7
Wheeling, W. Va.	92	67	25	27.2
Cincinnati, Ohio	87	60	27	31.1
Columbus, Ohio	78	52½	25½	32.7
Cleveland, Ohio	73	47½	25½	34.9
Toledo, Ohio	52½	30	22½	42.8
Youngstown, Ohio	83½	61	22½	26.9
Zanesville, Ohio	83½	59	24½	29.3
Cincinnati, Ohio	87	60	27	31.1
Columbus, Ohio	78	52½	25½	32.7
Cleveland, Ohio	73	47½	25½	34.9
Toledo, Ohio	52½	30	22½	42.8
Youngstown, Ohio	83½	61	22½	26.9
Zanesville, Ohio	83½	59	24½	29.3
Indianapolis, Ind.	87	60	27	31.0
Fort Wayne, Ind.	70	42½	27½	39.3
Louisville, Ky.	99	80	19	23.7
Chicago, Ill.	87	60	27	45.0
Milwaukee, Wis.	97½	60	37½	38.5
Racine, Wis.	97½	60	37½	38.5
St. Louis, Mo.	110½	100	10½	9.5
Burlington, Ia.	110½	100	10½	9.5
Grand Rapids, Mich.	74½	45	29½	39.6

(Continued from lead news page)
area sketched in the opening paragraphs will be affected.*

Further relief which is to come to manufacturers and dealers outside of this limited area will be in the form of subsequent action in other rate territories. Definite action indicated for the immediate future so far made public lies:

1. In the certainty of reduction in the classification rate from 110 per cent to 100 per cent of first class in official territory (which includes the Eastern Trunk Line, C.F.A. and N.E. rate territories).

2. Probability of reductions in the specific commodity rate for approval of which railroads in Southwestern territory already have petitioned the Interstate Commerce Commission. The 9½ to 50 per cent reduction in rates on motor vehicles in the C.F.A. territory therefore is the most important accomplished fact in the rate reduction situation as we go to press.

WASHINGTON, March 11—Filing of "experimental tariffs" on automobile shipments by six rail systems in Central Freigh Association territory, these rates to be effective for a year, from April 10, with the Interstate Commerce Commission was announced. These new tariffs, which set up a new commodity rate basis on automobile shipments originating from manufacturing or assembly plants in C. F. A. territory, and destined for points within territory approximately 500 miles wide, reduce, in effect, the cost of shipping motor vehicles and chassis, within the affected and adjacent territory, and indicate other extensive rate reductions which are expected to follow.

* The Central Freight Association Territory, all or parts of Pennsylvania, New York, West Virginia, Ohio, Michigan, Indiana, Illinois, Kentucky and Wisconsin. It lies west of Buffalo, Erie, Pa., and Pittsburgh and Wheeling; south of the Great Lakes; north of the Ohio River, and east of a line from Chicago to the Mississippi, along the river to its confluence with the Ohio.

The Interstate Commerce Commission has been petitioned by railroads in the Southwestern territory for permission to depart from the present consolidated automobile tariffs now in effect in the territory in favor of special automobile commidity rates for shipments moving for distances up to 500 miles, with concomitant changes in the classification basis for shipments moving over 500 miles, and concessions in the minimum carload weight, of such shipments.

Young Shipments Gain

DETROIT, March 10—L. A. Young Spring & Wire Co. has reported that to date March shipments have exceeded those of the corresponding period of February and indications are that increases in schedule will be necessary.

Regina Plant of G.M. Resumes Operations

Oldsmobile Cars Will Be Added to Output

OSHAWA, March 9—Operations at the Regina plant of General Motors of Canada, shut down last August, will be resumed at once, it is announced by H. A. Brown, vice-president and general manager of the company.

Coupled with the announcement that the plant would resume operations is another one that Oldsmobile will be added to the line of cars produced at Regina. Previously only Chevrolet and Pontiac had been made at the western Canadian plant.

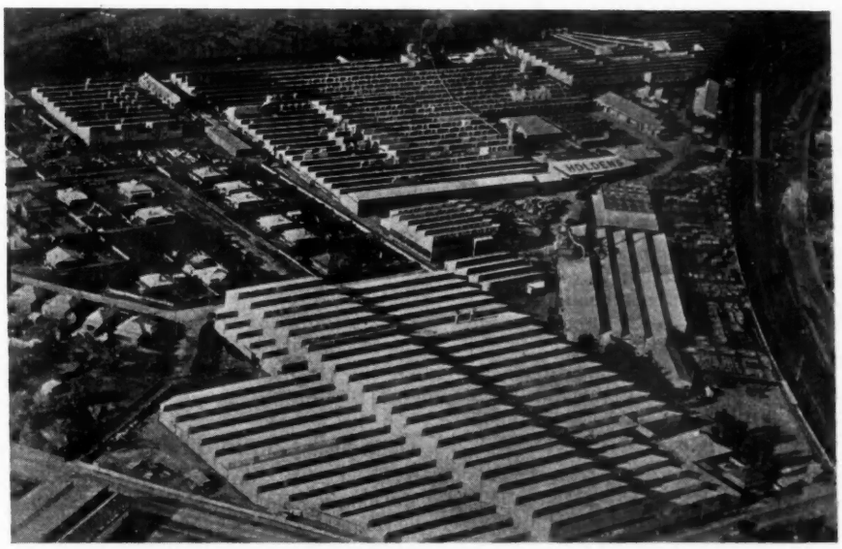
The Regina plant consists of five buildings, and the floor space includes 370,000 sq. ft. As high as 850 men have been employed in the factory. It was built two years ago to supply the demand for General Motors cars of the lighter type in the western provinces of Canada and will handle approximately 20,000 units per year.

Cadillac Shipments Gain

DETROIT, March 9—Cadillac Motor Car Co. reports an increase of 13 per cent in February shipments over the same period last year. The March production schedule calls for 2400 cars while the April output on the four lines of cars has been revised upward for the third time, as a result of improvement in sales during January and February and a projected improvement for March.

Berkey Succeeds Dowell

DETROIT, March 11—Peter Berkey has been elected a director of the Murray Corp. of America, succeeding Arthur P. Dowell, resigned.



Holden's Forty Acres

Plant of Holden's Motor Body Builders, Ltd., recently merged with General Motors (Australia) Pty., Ltd., into a new company—General Motors and Holden's, Ltd. The plant, where 80 per cent of bodies for all automobiles sold in Australia, exclusive of Ford, are made, covers 40 acres. The body plant, under the terms of the merger, will continue to manufacture for other than General Motors units

Men of the Industry and What They Are Doing

Mooney Sees Improvement

James D. Mooney, vice-president, General Motors Corp. in charge of export, who returned March 10 from a five weeks' trip in Europe, reports marked improvement in sales and employment in the overseas operations of his company.

The downward trend in sales which has been noticeable since last June showed a definite check in December and subsequent months have shown a substantial rise, according to Mr. Mooney. This has resulted in increasing employment in the overseas plants and also in domestic plants supplying parts for assembly abroad. Four operations abroad, namely the plants in England, Belgium, Denmark and Sweden, had the largest January in their entire business.

O'Neill Leaves Bendix

William L. O'Neill, president of the Bendix Stromberg Carburetor Co. and first vice-president of the Bendix Aviation Corp., has announced his resignation from the Bendix organization, effective April 1. Mr. O'Neill asserted he has no definite business plans, but indicated his intention of reentering the automotive industry, with which he has been prominently identified for twenty years, following his return from a vacation in California.

Morse Chain Names Two

F. C. Thompson, vice-president and general manager of the Morse Chain Co., Detroit and Ithaca, N. Y., subsidiary of the Borg-Warner Corp., has announced the following appointments: Frank M. Hawley, sales manager and chief engineer of the automotive and marine divisions, and C. B. Mitchell, production manager of the Detroit plant.

Thompson Names Graham

Matthew P. Graham has been appointed general manager of the Detroit plant of the Thompson Products Corp., according to an announcement by Frederick C. Crawford, executive vice-president.

Mr. Graham came to the Thompson company in 1922 as chief engineer and later was promoted to factory manager.

Silvertown Appoints Two

Two appointments in the sales organization of Goodrich Silvertown, Inc., retail division of the B. F. Goodrich Rubber Co., have been announced by J. P. Woodlock, general manager.

J. A. Hoban, former manager of the Chicago zone for Goodrich, was made merchandising manager of Goodrich Silvertown, Inc., and will make his headquarters in Akron. James S. Pedler, Goodrich airplane tire and accessory manufacturers' salesman in Akron and New York for two years, has been placed in charge of aeronautic sales of the retail division.

Barnes Appoints Two

Harold B. Reid, formerly purchasing agent at the Wallace Barnes Co., has been elected vice-president of the company and appointed general sales manager. Harry C. Barnes, treasurer of the company, has been appointed purchasing agent.

Company Elects Heil

Joseph F. Heil has been elected a director and vice-president of the Heil Co., Milwaukee, manufacturer of welded steel motor truck bodies, hydraulic hoists, tanks, etc. He is the son of Julius P. Heil, founder and president of the company.

Agency Elects Two

To fill the vacancy caused by the recent death of Guy C. Brown, Fletcher D. Richards and W. A. P. John, vice-presidents, have been elected to the board of directors of Campbell-Ewald Co.

Histed Organizes Company

J. R. Histed of Chicago, who has taken over the Chrysler distribution franchise for southern and eastern Wisconsin, has organized the Histed Motor Co. to handle the business.

Welch Leaves for Europe

Howard S. Welch, president of Studebaker-Pierce-Arrow Export Corp., sailed March 11 for Europe aboard the S. S. Leviathan.

World Bestos Names Flynn

F. J. Flynn, for the past seven years connected with the World Bestos Corp., Paterson, N. J., has been appointed sales manager.

To Confer on Highway

NEW YORK, March 12—Thomas H. McDonald, chief of the Bureau of Public Roads, and Pyke Johnson, Washington representative of the National Automobile Chamber of Commerce, are en route to Panama to confer with Latin American officials on plans for expediting the construction of the Inter-American Highway.

Hudson Negotiating For Canadian Rights

May Utilize Part of Durant Toronto Plant

DETROIT, March 12—Referring to published statements that they were contemplating purchase of a stock interest in Durant Motors of Canada, Ltd., officials of the Hudson Motor Car Co. stated today that their organization never entertained such a thought.

It was indicated, however, that discussion with Durant of Canada officials had taken place with a view to Hudson's using some of the facilities of the Durant Toronto plant, but that these negotiations were merely in a preliminary state. The foregoing has been confirmed, in substance, by Roy D. Kerby, president of Durant Motors of Canada.

"Our investigation to date has been largely with whether it is practical for us to service the Canadian public from a plant in Canada. We are considerably concerned over prospects of higher costs, which our investigation to date seems to indicate. We must have time to investigate and consider the matter from all angles," William J. McAneeny, president of the Hudson Motor Car Co., stated today, adding that no change in the present Hudson Canadian dealer organization is contemplated.

To Discuss Oil Chemistry

NEW YORK, March 10—Petroleum chemistry will be discussed at the eighty-first meeting of the American Chemical Society at Indianapolis, Ind., March 30 to April 3 by chemists from oil and motor companies, Federal bureaus and universities.

Among the speakers will be Lloyd Withrow and T. A. Boyd of General Motors Research Laboratories, who will report on photographic flame studies; H. M. Smith, Peter Grondona and H. T. Rall of the United States Bureau of Mines, who will speak on production of motor fuels from natural gases; August Holmes of the Technical Service Division of the Standard Oil Company of New Jersey will discuss carbureting values of gas oils and a new method for their laboratory evaluation; O. M. Reiss, Standard Oil Company of New York, will discuss the determination of the stability of gasoline in sunlight; Wheeler G. Lovell, John M. Campbell and T. A. Boyd of General Motors Research Laboratories will present a paper on detonation, and Elizabeth W. Aldrich will discuss the solubility of water in aviation gasolines.

There are also a number of other speakers representing universities and oil companies who will address this meeting.

Autocar Names Two

PHILADELPHIA, March 12—H. R. Gary has joined the Autocar Co., Ardmore, Pa., as assistant to the president. Mr. Gary had been connected with the Autocar organization previously, as assistant sales manager, and with the Boston Branch.

Martin A. O'Mara, former president and general manager of the Brockway Motor Truck Corp., has been named a vice-president of Autocar, and will be in charge of national users sales.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, March 11—There were a few developments last week to warrant the view that, in some sections of business, at least, a gradual improvement has been taking place. As spring approaches, there is a slight increase in business here and there. There is also evidence of a strengthening in the prices of some commodities. What improvement has taken place in industry is more noticeable in textiles than in other lines.

WHOLESALE TRADE

According to a report of the Federal Reserve Bank of New York, wholesale trade in that district during January was 25 per cent below that in the corresponding month last year.

ELECTRICAL OUTPUT

The output of electrical energy by public utility plants during January was approximately 8 per cent below that a year ago.

COMMERCIAL FAILURES

Commercial failures during February, according to R. G. Dun & Co., numbered 2563, as against the high record of 3316 during January. Although some of the 23 per cent decline in February is the result of the fewer days in that month, nevertheless, the number of failures was larger than for any other February on record.

CAR LOADINGS

Railway freight loadings during the week ended February 21 totaled 713,938 cars, which marks decreases of 6751 cars below those during the preceding week, of 113,622 cars below those a year ago, and of 191,565 cars below those two years ago.

CRUDE OIL OUTPUT

Average daily crude oil production in the United States during the week ended February 28 amounted to 2,100,900 barrels, as against 2,165,250 barrels for the preceding week and 2,623,950 barrels for the corresponding week last year.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended March 4 stood at 76.0, as against 75.8 for both the week and two weeks before. The current index number marks the first time that an increase above that in the preceding week has been reported since the week ended Dec. 6, 1930.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended March 4 were 17 per cent below those a year ago.

STOCK MARKET

Following three weeks of strength and increasing prices, the stock market last week was comparatively depressed. With the railway stocks leading, most issues showed net losses for the week. The volume of trading was moderate, on no day reaching the 4,000,000-share level.

BROKERS' LOANS

Brokers' loans in New York City decreased $8,000,000 during the week ended March 4. This decline follows an aggregate increase of $82,000,000 in the three weeks preceding.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended March 4 showed little change. There were increases of $1,000,000 in holdings of both discounted bills and Government securities. Holdings of bills bought in the open market decreased $5,000,000. The reserve ratio on March 4 was 84.1 per cent, as against 84.1 per cent a week earlier and 84.0 per cent two weeks earlier.

December Gasoline Consumption Bettered 1929 Figures by 6.3 Per Cent

NEW YORK, March 2—Gasoline consumption in 45 states and the District of Columbia for the month of December, 1930, according to the American Petroleum Institute, totaled 886,308,000 gal., compared with 833,689,000 gal. in Dec., 1929, an increase of 52,619,000 gal., or 6.3 per cent. Daily average consumption for Dec., 1930, was 28,591,000 gal., compared with a daily average of 32,465,000 gal. in Nov., 1930, a decrease in daily average during December of 11.9 per cent.

Gasoline consumption in 44 states and the District of Columbia for the 12 months ending with Dec., 1930 (Illinois and New York not being included for the reason that comparative figures for the year 1929 are not available), amounted to 11,022,179,000 gallons, compared with 10,395,731,000 gal. for the corresponding period of 1929, an increase of 626,448,000 gal. or 6.0 per cent.

GASOLINE CONSUMPTION BY STATES, DECEMBER, 1930

	Tax per Gallon Cents	Month of Nov., 1930 Gallons	Month of Dec., 1930 Gallons	Month of Dec., 1929 Gallons	12 Months Ending With Dec., 1930 Gallons	12 Months Ending With Dec., 1929 Gallons
Alabama	4	13,037,000	13,390,000	13,561,000	172,536,000	178,162,000
Arizona	4	6,113,000	6,497,000	7,012,000	76,044,000	72,862,000
Arkansas	5	9,550,000	10,686,000	9,467,000	138,632,000	134,606,000
Colorado	4	12,793,000	10,488,000	10,390,000	170,857,000	155,508,000
Connecticut	2	17,642,000	17,061,000	15,016,000	223,244,000	202,355,000
Delaware	3	2,507,000	2,816,000	3,211,000	35,997,000	32,576,000
Dist. of Columbia	2	6,761,000	6,443,000	5,785,000	79,469,000	71,884,000
Florida	6	18,625,000	21,213,000	20,530,000	227,691,000	224,117,000
Georgia	6	17,256,000	18,191,000	18,433,000	223,948,000	220,602,000
Idaho	5	4,835,000	3,578,000	3,976,000	61,265,000	55,125,000
Illinois	3	78,101,000	71,238,000	63,763,000	.....	.....
Indiana	4	42,493,000	35,544,000	29,603,000	466,713,000	432,095,000
Iowa	3	33,600,000	26,670,000	24,381,000	393,215,000	335,629,000
Kansas	3	27,700,000	26,153,000	26,265,000	385,528,000	360,928,000
Kentucky	5	13,665,000	12,893,000	11,302,000	168,241,000	154,816,000
Louisiana	5	16,299,000	14,527,000	14,705,000	183,859,000	176,770,000
Maine	4	8,765,000	6,985,000	5,137,000	108,622,000	96,036,000
Maryland	4	13,839,000	13,837,000	12,493,000	174,228,000	163,309,000
Massachusetts	2	42,787,000	41,998,000	35,196,000	537,017,000	501,909,000
Michigan	3	63,279,000	57,316,000	53,424,000	792,876,000	785,269,000
Minnesota	3	33,179,000	25,592,000	21,718,000	401,572,000	357,904,000
Mississippi	5	*10,430,000	*10,712,000	10,767,000	*138,183,000	141,451,000
Missouri	2	37,998,000	35,581,000	29,494,000	440,927,000	392,957,000
Montana	5	†5,846,000	4,707,000	4,667,000	82,932,000	79,167,000
Nebraska	4	18,636,000	16,370,000	14,935,000	228,446,000	224,894,000
Nevada	4	1,430,000	1,335,000	1,404,000	18,615,000	17,813,000
New Hampshire	4	4,990,000	4,010,000	3,344,000	64,918,000	58,323,000
New Jersey	3	47,847,000	40,942,000	37,643,000	547,977,000	498,064,000
New Mexico	5	4,480,000	4,414,000	4,037,000	54,661,000	45,799,000
North Carolina	5	22,272,000	22,053,000	27,522,000	250,669,000	265,112,000
North Dakota	3	7,559,000	4,096,000	3,762,000	120,034,000	124,383,000
Ohio	4	77,784,000	70,193,000	67,196,000	970,085,000	953,552,000
Oklahoma	4	32,643,000	23,050,000	26,367,000	329,244,000	316,302,000
Oregon	4	12,749,000	11,593,000	13,170,000	169,872,000	163,672,000
Rhode Island	2	7,994,000	6,885,000	5,781,000	89,220,000	77,827,000
South Carolina	2	10,068,000	9,785,000	10,112,000	119,213,000	118,596,000
South Dakota	4	10,124,000	7,980,000	7,485,000	137,867,000	123,931,000
Tennessee	5	16,478,000	16,936,000	16,219,000	215,244,000	195,036,000
Texas	4	64,785,000	66,331,000	65,438,000	801,311,000	769,608,000
Utah	3½	4,447,000	3,792,000	4,032,000	60,137,000	56,547,000
Vermont	4	3,890,000	2,966,000	2,419,000	46,998,000	43,992,000
Virginia	5	18,340,000	18,056,000	16,548,000	228,454,000	208,304,000
Washington	3	20,450,000	19,963,000	18,722,000	271,070,000	253,457,000
West Virginia	4	11,766,000	9,953,000	8,980,000	140,055,000	126,539,000
Wisconsin	2	35,437,000	29,046,000	26,274,000	437,878,000	393,396,000
Wyoming	4	2,675,000	2,443,000	2,003,000	36,615,000	34,547,000
Total		973,944,000	886,308,000	833,689,000	11,022,179,000	10,395,731,000
Daily Average		32,465,000	28,591,000	26,893,000	30,198,000	28,481,000
Increase over previous year: Amount of Increase		.....	52,619,000	.....	626,448,000	.....
Percentage Increase in Daily Average		.....	6.3%	.....	6.0%	.....

		Quarter Ending Sept. 30, 1930	Quarter Ending Dec. 31, 1930	Quarter Ending Dec. 31, 1929	12 Months Ending With Dec. 31, 1930	12 Months Ending With Dec. 31, 1929
California	3	357,199,000	336,140,000	323,592,000	1,336,535,000	1,253,337,000
Pennsylvania	3	251,874,000	267,573,000	247,044,000	930,033,000	900,496,000

* Estimated.
† Revised.

Harley Gets Soviet Order

MILWAUKEE, March 9—The Harley-Davidson Motor Co. has received an order from the Soviet government for 81 motorcycles with side cars and complete equipment with the exception of tires. Immediate delivery is specified. Other foreign orders recently booked include 56 for Japan, 40 for Holland, 30 for Sweden, 20 for Denmark and 10 for South Africa. Australia, long a fertile market for Harley-Davidson, has sharply curtailed its purchases, due to the unfortunate economic conditions prevailing there.

Arrow Sells 11 Planes

LINCOLN, NEB., March 9—Eleven planes were sold by the Arrow Aircraft & Motors Corp. and three distributors and dealers were signed up during the 10-day period ending March 6.

Perfect Circle Earns $608,503 in 1930

Assets Show 7.4 Ratio to Liabilities

CHICAGO, March 9—At the regular annual stockholders' meeting of the Perfect Circle Co., Hagerstown, Ind., held March 2, it was announced that the company's net income for 1930, after all charges and deductions including taxes and depreciation, was $608,503 or $3.74 a share on the 162,500 shares of stock outstanding, compared with $901,320 or $5.54 a share for the year 1929.

The company's balance sheet as of Dec. 31, 1930, showed an exceptionally strong financial position. Current assets amounted to $1,744,219 against current liabilities of $235,607, or a ratio of 7.4 to 1. At the end of 1929 current assets were $1,453,940 against current liabilities of $271,128 or a ratio of 5.4 to 1. Cash and liberty bonds alone amounted to $591,453 or a sum large enough to liquidate the present current liabilities and also pay the estimated dividend requirement for 1931 or $2 a share on the 162,500 shares of stock.

Auburn Shipments Increase

CHICAGO, March 9—February shipments of Auburn and Cord cars show a sharp increase over February of last year, N. E. McDarby, vice-president in charge of sales, announces. Total number of cars shipped in February was 4052, as compared with 1768 in February of last year and 2239 in February, 1929. During the first two months of 1931 shipments totaled 6069 cars, which is approximately one-half the total number of cars shipped during the entire year of 1930. Unfilled orders on hand for Cord and Auburn cars March 1 were approximately 2600 more than on February 1, 1931.

Holdens Merger Sanctioned

NEW YORK, March 9—Stockholders of Holden's Motor Body Builders, Ltd., of Adelaide, Australia, unanimously approved the merger of that company with General Motors (Australia) Pty., Ltd. The merged company is to be known as General Motors and Holdens, Ltd. The Holden's stockholders adopted a resolution expressing confidence in the directorate of the merged company.

Oakland Sales Increase

PONTIAC, March 9—Oakland Motor Car Co. has reported February retail sales totaling 6658 units, representing an increase of 1103 units over January sales.

February production increased about 2000 cars over January and production for March is expected to show approximately the same increase over February.

Financial Notes

John Warren Watson Co. reports net loss for the year 1930 of $264,269 as compared with net loss for the previous year of $323,137.

Muskegon Piston Ring Co. reports net profit for 1930 of $166,474. This is equivalent to $3.20 a share on common stock and compares with earnings of $300,536, or $5.78 a share, in 1929. Regular quarterly dividend of 75 cents a share, payable March 31 to stockholders of record March 15, has been declared.

Perfect Circle Co. reports net profit for 1930 of $608,503. This is equivalent after all charges to $3.74 a share and compares with earnings of $901,320, or $5.54 a share, for 1929.

Studebaker Corp. and subsidiaries, including Pierce-Arrow Motor Car Co., reports profit for 1930 of $1,540,202. After deducting minority stockholders' interest in Pierce-Arrow preferred and Class A stock, the profit is $1,000,216, equivalent after Studebaker preferred dividends to 27 cents a share on common stock. Total earnings compare with net profit for 1929 of $11,928,161, or $5.53 a share, on the number of stocks outstanding at the end of the year.

Auburn Automobile Co. has declared regular quarterly dividend of $1 payable April 1 to stockholders of record March 21, also a two per cent stock dividend payable April 1 to holders of record March 21.

Chicago Pneumatic Tool Co. has omitted its quarterly dividend of 87½ cents on preferred stock due April 1.

General Tire & Rubber Co. has declared regular quarterly dividend of $1.50 on preferred payable April 1 to stockholders of record March 20.

Waukesha Motor Co. has declared regular quarterly dividend of 75 cents payable April 1 to stockholders of record March 15.

Electric Auto-Lite Co. and subsidiaries report net income for 1930 of $5,043,402 equal after preferred dividends to $5.32 a share on common stock. This compares with profit for 1929 of $11.03 a share on common stock.

Moto Meter Gauge & Equipment Corp. reports net loss for 1930 of $637,882 as compared with profit for 1929 of $161,150.

Bohn Aluminum & Brass Corp. reports net profit for 1930 of $725,596. This is equivalent to $2.06 a share on capital stock and compares with earnings of $2,619,722, or $7.43 a share, for 1929.

McQuay-Norris Mfg. Co. reports net profit for 1930 of $469,616, or $4.03 a share on capital stock. This compares with $676,184, or $6.04 a share, for 1929.

Chicago Pneumatic Tool Co. and subsidiaries report net profit for 1930 of $209,839, or $1.12 a share on preferred stock as compared with $1,582,161 for 1929.

Goodyear Tire & Rubber Co. of Canada has declared regular quarterly dividend of $1.25 on common and $1.75 on cumulative preferred, both payable April 1 to holders of record March 14.

Hercules Motors Corp. has declared regular quarterly dividend of 30 cents payable April 1 to holders of record March 20.

United States Rubber Co. reports net profit from operations during 1930 of $928,882. After provision for depreciation, obsolescence and other adjustments, this becomes a net loss of $6,980,141.

B. F. Goodrich Co. reports net loss for 1930 of $8,374,148 after all charges.

Ford Motor Co. of Sweden has declared a dividend of 10 per cent.

Durant Reduces Debt

NEW YORK, March 10—Durant Motor Co. of Michigan has reduced its indebtedness by $1,800,000 during the time since Mr. W. C. Durant resumed personal control last year, according to announcement sent out to stockholders. The company has also improved its cash position to a marked extent during that period. This has been a result largely of increased sales effort and conversion of inventories into cash through sales.

Steel Operations At Higher Rate

Further Price Advance on Sheet Stock Looms

NEW YORK, March 12—The leading steel producing interest's latest unfilled tonnage statement, which was published on Tuesday, showing a decrease of 167,157 tons on the corporation's order books on Feb. 28 from the end-of-January backlog, reflected the much higher rate of production last month rather than any marked recession in commitments.

The American Iron and Steel Institute reported last month's output in terms of ingots as 2,527,318 tons, the largest in any month since last October, and denoting a rate of operations of 52.60 per cent of capacity as compared with 45.94 per cent in January and 38.57 per cent in December. Orders booked since March 2 are known to have been sufficient to permit maintenance of the February record and in a good many mills a moderate stepping up.

It is intimated that announcements of a $2 per ton advance in sheet prices and of $1 per ton increase in the price of steel bars and other heavy rolled products overhang the market. A Middle West "independent" announced unchanged sheet prices for second quarter with the understanding that if conditions justified upward revision of prices it would be made without delay.

All of which so far amounts to notice to buyers that they have nothing to gain by deferring the placing of their second quarter orders, and in fact considerable business has been "smoked out" in the last few days as a result of these developments.

A good deal of sheet tonnage has been engaged by the two leading manufacturers of low-priced cars. Business placed by automotive consumers in general shows broadening in all directions, interest in alloy steels, cold-finished bars, and wire having improved further.

Pig Iron—Automotive foundries are melting more iron, but second quarter commitments are coming out rather slowly. Prices are unchanged.

Aluminum—Routine conditions prevail in all departments of the market.

Copper—The market is a shade easier with custom smelters having made sales at 10¾c, delivered Connecticut. Most consumers have virtually covered their second quarter requirements.

Tin—Straits tin was quoted at 27.35c at the opening of the week. This denotes a gain of 1¼c over the price current a month ago. Demand is light.

Lead—Quiet and unchanged.

Zinc—A somewhat improved statistical position has given the market a steadier tone, a slight decrease in stocks and increase in unfilled tonnage being reported.

Lincoln Air Reports Assets

NEW YORK, March 10—Lincoln Aircraft Co. in its balance sheet as of Dec. 31, 1930, shows total assets of approximately $338,000 as compared with assets as of Dec. 31, 1929, of $367,000. Current assets are $116,000 as against current liabilities of approximately $10,500.

Czech Car Duties Increased March 10

New Specific Rates Effective by Decree

WASHINGTON, March 13—The conventional rate of duty of 43 per cent ad valorem imposed on automobiles imported into Czechoslovakia from most-favored-nation countries, including the United States, is abolished, and the higher specific rates of the general tariff schedule became effective by decree on March 10, according to cablegrams from Commercial Attache Karl L. Rankin, Prague, and Automotive Trade Commissioner W. L. Finger, Paris.

This follows an agreement between Czechoslovakia and France, recently signed at Geneva, by which France releases Czechoslovakia from the obligation of maintaining the rate of 43 per cent specified in the Franco-Czechoslovak agreement of July 17, 1928, for the importation of French automobiles into Czechoslovakia. This same rate applied to automobiles from the United States and other countries having most-favored-nation rights in Czechoslovakia.

The general rates of Czechoslovak import duty upon automobiles which thus became effective March 10, are as follows: Passenger automobiles are increased from 43 per cent ad valorem to 2300 Czechoslovak crowns per 100 kilos net for autos weighing up to 1000 kilos; and 2700 Czechoslovak crowns per 100 kilos for automobiles weighing over 1000 kilos.

Ford of Canada Adds Buses

EAST WINDSOR, ONT., March 10—The Ford Motor Co. of Canada, Ltd., enters the Canadian motor bus field with three new bus body types mounted on the 157-in. commercial chassis. The bodies were designed and are manufactured in Canada by a Canadian company. They are intended for urban, interurban and school services. The new buses are equipped to carry 18 to 21 passengers.

Sterling Adds Workers

KNOXVILLE, March 10—The Sterling Wood Products Co. of Knoxville, Tenn., manufacturers of wood parts for automobiles, employed 300 additional men beginning March 1. The plant started operations a few weeks previous with 200 employees. E. F. Miller of Detroit has succeeded F. A. Butler as manager of the plant.

Hayes Books Orders

GRAND RAPIDS, March 10—Hayes Body Corp. has received an order for immediate shipment of 8000 bodies for the new De Vaux automobile.

This order, together with increased business from the Marmon and Peerless accounts, has necessitated adding 600 men in the Grand Rapids plant and 200 men in the Indianapolis plant.

Aeronca to be Made in Canada

KITCHENER, ONT., March 9—As the result of an agreement entered into between the Aero Corp. of Canada and the Aeronautical Corp. of America of Cincinnati, the Aeronca monoplane will be manufactured in Kitchener.

Six Point Suspension

Industrial Plants Corp., Columbus, Ohio, will sell at auction March 17, the land, buiding, machinery and equipment of American Steel (of Indiana), Inc., Terre Haute, Ind.

Truscon Steel Co. announces the appointment of Clark C. Pond as vice-president in charge of engineering and sales. Mr. Pond was formerly with the David Lupton & Sons Co.

The Autocar Co., Ardmore, Pa., announces that the new building of its Philadelphia factory branch at 34th St. & Indiana Ave., which contains over 90,000 sq. ft. of floor area will soon be occupied.

Fairey Aviation Co., England, shows net profit of £169,964 in its annual report for the year ended September 30, 1930, an increase of £5,010 over the previous year, according to the Department of Commerce.

Belgium exported 5,780,800 kilos of pneumatic tires during the calendar year 1930. Expressed in units this includes 578,080 automobile casings compared with 655,225 for the calendar year 1929. The Rubber Division Bureau of Foreign and Domestic Commerce points out that the estimate of the number of casings shipped is based on a figure of 10 kilos equaling one casing.

The United Kingdom during the month of January, 1931, exported to foreign countries 90,631 automobile casings as compared with 90,083 in December, 1930. The leading markets in January were New Zealand, France, Irish Free State, British India, British South Africa and Czechoslovakia.

Curtiss-Wright Corp. is planning a series a free public lectures to educate the public in the opportunities offered by aviation. The lectures are open to anyone sixteen years old or more and will cover the theory of flight, airplane operating, regulations and commercial aviation.

A Studebaker President Eight set a new record in the Southern Circuit Automobile Race of South America and won the "La Nacion" cup. Time for the 380 kilometer course was 2 hrs. 58 min. 31⅘ seconds.

Cleveland Automobile Manufacturers and Dealers Association will hold its annual meeting Thursday, March 19, at the Hotel Cleveland. D. W. Ruark, Chicago, Director of Market Development for the Motor & Equipment Association, will speak.

National Grange, 630 Louisiana Ave., Washington, D. C., is sponsoring an essay contest for the younger members on the subject of highway safety. Prizes for the contest winners will be provided by the National Automobile Chamber of Commerce.

The Alemite Corp. is offering to the trade Alemite motor oil, a Pennsylvania crude grade product.

World Bestos Corp., Paterson, N. J., manufacturer of Grafild brake lining, has issued a new comprehensive catalog and price list.

France exported during the calendar year of 1930, 1,169,880 automobile casings compared with 1,478,080 casings during the calendar year 1929, according to the Rubber Division Bureau of Foreign and Domestic Commerce.

Chinese automotive trade fell off sharply during 1930, according to a report from Trade Commissioner A. Viola Smith to the Automotive Division Bureau of Foreign and Domestic Commerce. The prevailing depression in China was intensified by import duties being on a gold basis and the concomitant depreciation of silver. Danger of military forces confiscating motor vehicles added to the existing sales resistance. The outlet outlook for 1931 is increasingly pessimistic, according to reports, because of increased import duties.

Crude rubber consumption in the United States amounted to 160,000 long tons during the last 6 months of 1930, and consumption of reclaimed rubber amounted to 65,500 long tons in the same period, according to the Rubber Division, Bureau of Foreign and Domestic Commerce. A complete report on these items is available from the Division.

Nash Motors Co. has added 17 new dealers, according to an announcement made March 4.

G. H. Tindale, Australian customs representative in New York, has advised that duties on airplanes and other aircraft have been postponed until April 1, 1931.

Glenn Martin Buys Chevrolair Interest

Engine Manufacturer Becomes Subsidiary

BALTIMORE, March 11—Acquisition of the minority interest in the Chevrolet Aircraft Corp. and changing the name of the subsidiary to the Glenn L. Martin Motors Co., has been announced by officials of the Glenn L. Martin Co. The Martin Model 333, a four-cylinder in-line inverted aircraft engine, will be placed in production immediately, and some units are expected to be ready for delivery before the end of March.

Glenn L. Martin is president of the new engine subsidiary of the Glenn L. Martin Co. Charles A. Van Dusen, vice-president and general manager of the airplane company, has been made vice-president of the engine company. Louis Chevrolet, developer of the new engine, is vice-president and general manager. E. H. Godfrey, formerly with Pratt & Whitney and Wright Aeronautical, has been made chief engineer. Lee Beatty will be production manager and assistant to Mr. Chevrolet. Warren L. Baker, sales manager of the airplane company, will also be sales manager of the subsidiary.

Gadsden Plant at Peak

BIRMINGHAM, March 10—Peak production of 6500 tires per day was started March 1 by the Goodyear Tire & Rubber Co. at its Gadsden, Ala., plant. The plant is running on a five-and-one-half-day-week schedule with three shifts of eight hours each. For some time the production had been 5500 tires a day and the increase is said to be the limit of the present equipment.

Olds Schedules Increased

DETROIT, March 10 — Olds Motor Works reports a March production schedule of 7500 units, equivalent to approximately 600 more than March, 1930. The factory states that field stocks of new cars are 500 less than at this time last year with used car stocks one-third lower.

Royale Price Increased

LANSING, March 11—The introductory price of the Reo Royale 8-35, which was set at $2,485 last October, will be continued only until April 1, when the price will be increased to $2,745, according to E. J. Poxson, general sales manager of the Reo Motor Car Co.

Willys Orders Increase

TOLEDO, March 11—"Willys-Overland entered March with a larger volume of orders than on any previous first of the month since May of last year," L. A. Miller, president, has announced.

See Motor Carrier Laws As Unconstitutional

N.A.C.C. Attorneys Publish Their View

NEW YORK, March 9—Attempts to regulate contracts, rates, practices and the right to engage in the business of the contract motor carrier are in violation of the Federal constitution, according to an article in the *Harvard Law Review*, prepared by LaRue Brown and Stuart N. Scott, counsel for the Motor Truck Division of the National Automobile Chamber of Commerce.

These attempts virtually compel the contract carrier to become common carriers, although the statutes do not expressly require this. Such attempts are regarded by the authors of this article as unconstitutional.

Rate regulation and certification of contract carriers are not "affected with a public interest," in the opinion of the authors and, consequently, cannot be regulated by law without violation of constitutional rights.

The third point brought out in this article is that certificates of convenience and necessity are used to determine who shall use the highways and not how the highways shall be used. Certification of contract carriers, therefore, is as much a regulation of the business as rate regulation and consequently is equally invalid, in the opinion of the authors of this article.

Begins New Service

WASHINGTON, March 9 — A monthly statement (non-statistical) of the supply of automobiles on hand in foreign markets has been commenced as a new information service of the Automotive Division, Department of Commerce. Cabled reports of the automobile stock situation will be received at the begining of each month, compiled by countries in the division and issued immediately to the automobile industry so as to provide current information concerning this important element of foreign marketing conditions.

Mark of Origin Not Required

WASHINGTON, March 10—The application to the British Board of Trade for the issuance of an order-in-council under Section 11 of the Merchandise Marks Act, 1926, to require the marking of the country of origin on motor vehicles and parts imported into the United Kingdom, has been officially withdrawn, according to a cablegram received in the Department of Commerce.

Noblitt-Sparks Declares

CHICAGO, March 9—Directors of Noblitt-Sparks Industries, Inc., have declared the regular quarterly dividend on the common stock of 75 cents a share in cash and 1½ per cent in stock, payable April 1 to holders of record March 20. Business of the company at the present time shows material improvement, Q. G. Noblitt, president, stated.

+ + CALENDAR + + OF COMING EVENTS

SHOWS

Geneva, Automobile .....March 6-15
Los Angeles (Transportation).March 15-28
Altoona, Pa., Automobile.....April 15-27
International Garage Exposition, Berlin, Germany .....May 9-Aug. 9

CONVENTIONS

American Chemical Society, Indianapolis, Ind. .....March 30-April 4
Washington Motor Freight Assn., Meeting, Seattle, Wash. ..April 11-13
Aeronautical Chamber of Commerce, Detroit .....April 11-19
S.A.E. Natl. Aeronautic Meeting, Detroit, Mich.....April 15-16
Middle Atlantic Jobbers Convention, Philadelphia, Pa. .....April 20-21
American Welding Society Meeting, New York, N. Y. .....April 22-24
Natl. Battery Mfg. Assn. Convention, Niagara Falls .....April 24-25
Retail Delivery Assn. Convention, Washington, D. C. .....May 25-28
U. S. Chamber of Commerce, Atlantic City .....April 28-May 1
International Chamber of Commerce, Washington, D. C. .....May 4-9
National Foreign Trade Council, New York .....May 27-29
Fourth National Oil and Gas Power Meeting, A.S.M.E., Madison, Wis., June 15-18
S.A.E. Summer Meeting, White Sulphur Springs .....June 15-19
S.A.E. Aeronautic Meeting (in conjunction with Natl. Air Races), Cleveland, Ohio .....Sept. 1-3

Eaton Profits Increase

CHICAGO, March 9—Officials of the Eaton Axle & Spring Co. report that profits for January were the best in any month since last September and that preliminary figures for February indicate that it will show the highest monthly profit since last June. February shipments of the Wilcox-Rich Corp., subsidiary of Eaton Axle, were the largest of any month since last June.

Buick Sales Increase

DETROIT, March 9—Buick Motor Co. has reported an increase of seven per cent in retail sales for February over the same month last year.

Buick dealers delivered 6096 during February compared with 5674 during the same period last year. As compared with January of this year, February sales show an increase of 17 per cent.

Auburn Declares

AUBURN, IND., March 9—Auburn Automobile Company has announced declaration of its regular quarterly dividend of $1 a share cash and the usual additional quarterly dividend of two per cent, payable in stock. The dividend voted is payable April 1, 1931, to stockholders of record at the close of business March 21, 1931.

Ford Leads Michigan January Registrations

All Car Sales Drop 39 Per Cent From '30

DETROIT, March 7—New passenger car registrations in the state of Michigan during January totaled 5993, a decrease of 35 from the total of 6028 in December and a decrease of 3920 or 39.5 per cent from the January, 1930, total of 9913.

Ford registrations in Michigan last month totaled 1906 or 32.2 per cent of all makes and a decrease of 227 or approximately 10.6 per cent under the Ford December total of 2133 and a decrease of 62.1 per cent from the January, 1930, total of 5031.

Chevrolet passenger car registrations last month totaled 1679 against 2201 in January, 1930. Pontiac was third with 382, Oldsmobile fourth with 307 and Buick fifth with 302.

Total commercial car registrations in Michigan last month were 767, a decrease of 269 or 25.9 per cent from the total of 1036 in December and a decrease of 434 or 36.1 per cent from the total of 1201 in January, 1930. Ford showed a total of 422 as compared with 614 in December and 570 in January last year. Chevrolet was second on the list with 220 and International third with 32.

Chevrolet Employs 34,000

DETROIT, March 9—Chevrolet factory employment is currently running in excess of 34,000 men, which represents an increase of more than 30 per cent over November when the new 1931 models were announced.

W. S. Knudsen, president, in his announcement stated that the company's dealers in the United States reported sales of 50,732 cars and trucks in February compared with 47,495 in January and 46,733 in December.

Durant Offers Rights

NEW YORK, March 9—Durant Motors, Inc., has extended to stockholders rights to subscribe to 500,000 shares of treasury stock at $3 a share in the ratio of one share for each two shares now held. Rights will expire April 10. Proceeds from this offering will be to provide additional working capital.

Rodney D. Briggs

DETROIT, March 9—Rodney D. Briggs, 77 years old, father of W. O. Briggs, chairman of the board and president of Briggs Mfg. Co., and M. L. Briggs, vice-president of Briggs Mfg. Co., died late last Thursday in St. Petersburg, Fla.

Nash Orders Increase

KENOSHA, WIS., March 9—Factory orders received for Nash cars on March 1 reveal an increase of 53 per cent over those received Feb. 1, according to C. H. Bliss, sales manager of the Nash Motors Co.